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HOW CAN RAILWAYS BE MADE MORE EFFICIENT IN THE TRANSPORTATION OF FREIGHT?

By WILLIAM P. SHINN, M. Am. Soc. C. E.

READ AT THE ANNUAL CONVENTION OF THE SOCIETY, HELD AT ST. PAUL AND MINNEAPOLIS, MINN., JUNE 19TH, 1883.

In the discussion of my paper on "The Increased Efficiency of Railways for the Transportation of Freight"* it was requested that I should sum up the discussion, which I propose to do in this paper.

It has been a disappointment to me, as to many other members of the Society, that so little discussion has been brought out from the operating officials of railways, as they are the parties who must be reached if any practical measures are to be adopted to further increase railway efficiency.

The criticisms having an adverse tendency may be divided for the purpose of their consideration into two classes, viz. :

A. Suggestions of omissions in my enumeration of the causes which have led to, or made possible, the greatly increased efficiency shown to have been reached; and

* Read at the meeting of Am. Soc. of Civil Engineers, December 6, 1882, and published in Transactions for November, 1882, Vol. XI., page 365.

B. Objections to and criticisms of my enumeration of means to be adopted to secure the further increase in efficiency which is desirable and attainable.

I will proceed to discuss them under these two heads, beginning with class A.

I will remark, parenthetically, that I did not attempt to discuss "economy of cost," except as it is connected with efficiency in accomplishing the work better, quicker, or more of it; as, for instance, an improved locomotive might burn less fuel in doing the same work, but be unable to do more work; while that would be an increase of efficiency, economically considered, it would not be, if I may so express it, quantitively considered.

My discussion has been aimed at the consideration mainly of quantitive efficiency, upon which, of course, every economy in cost has an indirect effect in widening the range and increasing the movement of traffic, but the general subject of "Economy in Railway Management" is much too broad for discussion in connection with my former paper.

Mr. John B. Jervis, Hon. M. Am. Soc. C. E., refers to the great importance of improvement in the road-bed, in which he is, of course, entirely correct. The road-bed is the foundation of the structure, and, like any other foundation, it must be solid, well drained, with an abundance of good ballast, as a condition precedent to the maintenance of good track.

The adoption of the steel rail, forming a more enduring superstructure, has led to the use of more and better ballast, and in many cases to changes in alignment which have resulted in better road-bed.

Mr. Jervis suggests that my estimate of the saving in cost for rails, and labor on track, by the adoption of steel rails, with their accompanying improvements, as being from 40 to 60 per cent. of the cost per ton per mile when iron rails were used, is rather large, and it does appear so. When it was made it was based upon general information, but the exact data, showing a comparison of the expenses for rails and for labor repairing track, on the Pennsylvania Railroad and the Pittsburgh, Fort Wayne and Chicago Railway (for details of which see Schedule A) give, the following as the cost for those items per "engine mile" and per "ton mile," viz.:

PENNSYLVANIA RAILROAD.

Average for 5 Years.	Cost per Engine Mile.			Cost per Ton Mile.		
	Rails.	Labor.	Total.	Rails.	Labor.	Total.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
1868-1872.....	8.41	2.08	10.49	.0754	.0186	.0940
1878-1882.....	1.79	3.16	4.95	.0095	.0175	.0270
		Increase.				
Decrease.....	6.62	1.08	5.54	.0659	.0011	.0670
" per cent.....	$78\frac{7}{10}$	$51\frac{9}{10}$	$52\frac{8}{10}$	$87\frac{4}{10}$	$5\frac{9}{10}$	$71\frac{2}{10}$

PITTSBURGH, FORT WAYNE AND CHICAGO RAILWAY.

Averages for Years.	Cost per Engine Mile.			Cost per Ton Mile.		
	Rails.	Labor.	Total.	Rails.	Labor.	Total.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
1866-1868.....	9.27	3.95	13.22	.1217	.0520	.1737
1878-1882.....	1.18	3.08	4.26	.0094	.0245	.0339
Decrease.....	8.09	0.87	8.96	.1123	.0275	.1398
" per cent.....	87	22	$67\frac{8}{10}$	$92\frac{3}{10}$	$52\frac{8}{10}$	$80\frac{5}{10}$

From which it appears that the reduction in cost per ton per mile of the items referred to has been from 70 to 80 per cent. on the roads named. This large decrease will not, probably, continue to be shown, as steel rails become worn, and the annual renewals reach their average, but it will probably fully equal my estimate of 40 to 60 per cent.

The increase in traction power of locomotives, referred to by Mr. Jervis, although it has been, during the period covered by Mr. Jervis' ripe experience, a potent factor, has not been so prominent during the ten years covered by my inquiry. It was rated as fully one-sixth of the

weight on drivers in 1870, while it does not exceed one-fifth now—an increase in proportion of twenty per cent.

Mr. Jervis' reminder of the progress made in this regard in fifty years is as interesting as it is instructive.

Mr. Jos. S. Paxson writes suggesting the importance of "loose," or "independent" wheels on cars, as a measure of great economy and consequent efficiency, and refers to a table of curve and grade resistances, from which he quotes as follows:

An engine that will haul on a level tangent	1 096 tons
will haul on a level 5° curve	921 "
" " " " 10° "	662 "

and adds: "Now, if axles with independent wheels will effect a saving "of, say, one-half the above losses, and I think much more than that can "be saved by their use," &c. To which I can only say, that the best authorities on curve resistance place it at about 0.45 pounds per ton per degree of curvature, of which but 0.175 pounds are assigned to the slipping of wheels, owing to difference in length of rails, or less than 40 per cent. of the whole curve resistance, the saving of which is not considered to justify the adoption of loose wheels, with their difficulties and objections.

Mr. Robt. L. Harris, M. Am. Soc. C. E., suggests: "The telegraph "(and its proper use) is one great power for the increased efficiency of "railroads for the transportation of freight," &c., as a point not touched upon in my paper. I do not undervalue the use of the telegraph, but my paper had special reference to the increase in efficiency during the decade from 1870 to 1880, while the telegraph was quite fully brought into use during the previous decade. The telegraph is deserving of all that Mr. Harris says of it as a factor in railway efficiency.

Referring next to the criticisms under class B, Mr. H. Bissell, M. Am. Soc. C. E., states as an objection to running engines "First in, first out," that "You cannot lay the blame for want of care of the "engines to the parties who run them." This is an old objection, and is fully discussed in my remarks published in Transactions for April, 1883.

It is the question of the division of labor, found so necessary in all mechanical operations, and whenever it is brought about the objection disappears.

The principal adverse discussion is upon my proposition of a per diem charge for freight cars when on foreign roads.

I will here call attention to the fact, that I do not suggest this plan as a panacea for all the evils that restrict car-movement, but only as the best means for correcting the worst of those evils. My critics all agree that it is a great evil—and I may add a *growing* one—and that it should be remedied; they agree that something should be done, but do not approve of the per diem charge. Their objections are, briefly stated, as follows:

Mr. Chas. Paine, Prest. Am. Soc. C. E., says:

1. A "demurrage" charge for detention of cars at stations or sidings is a success, but

2. Its collection cannot be entrusted to the Freight Department.

Mr. Paine's first proposition meets my approval—a reasonable demurrage charge must be made for cars unduly detained in loading and unloading, not only in the interest of the railroad company, but also for the encouragement and protection of those parties who do load and unload promptly, and who suffer in busy seasons when others detain cars unnecessarily. But his second proposition seems to me to be equivalent to saying that the officers and agents of the Freight Department of railways cannot be kept subordinate to the general management; that they cannot be made to carry out the policy decided upon. To this I cannot agree.

That they have frequently occupied such a position, I admit; but that it is a necessity of the service, or that their assuming such a relation to the responsible management shows anything but a lack of fitness for the position, I cannot concede.

The arranging for, and charging of a proper demurrage, is a proper function of the Commercial Department, and that department can best assume and enforce it. A general freight agent who cannot or will not, needs an immediate successor.

3. Mr. Paine admits that "the detention of cars on foreign roads is one of the great evils of our railway system," but "cannot agree that the per diem charge for cars when on foreign roads would be a success."

The fact that "it was once tried *for a few weeks*" Mr. Paine would scarcely rely upon as demonstrating its impracticability. What wholly new thing ever achieved success in its first few weeks' trial?

Did the locomotive, with its rack and pinion, its "grasshopper legs," *et id genus omne?* Was the telegraph or the telephone, the electric light, or the Bessemer converter?

Per contra, the letters of Mr. E. P. Vining, attached hereto as Appendix D, show that the plan was in operation between the Chicago, Burlington and Quincy Railroad and the Union Pacific Railway *for two years*, and that it gave satisfaction, and was only abandoned because other companies did not adopt it, and those companies did not desire to keep up two systems.

The reasons assigned by Mr. Paine for the alleged impracticability are partly due to bad management, or lack of management, which should be removed or improved as a condition precedent to the success of any scheme for increasing efficiency; and they are partly of such an accidental or infrequent occurrence as to need a special rule or exception to govern them.

The snow-storm or flood, which Mr. Paine pictures as raging at the terminus, may and will as frequently operate on the long and intermediate lines as on the short and terminal roads.

Blockades, except from some natural and extraordinary obstruction, need not and should not occur. While they do occur, they demonstrate that cars are in excess of other facilites; when cars are idle because they are not needed, they should be at home, and not on some foreign railroad waiting for traffic.

It will need some looking ahead, both to avoid blockades of loaded cars and to avoid getting many empty foreign cars on hand, but it is worthy of note that the cost to any company will be, not the whole sum it pays for other companies' cars, but that sum *minus* what it receives from other companies for the use of its own cars.

4. Mr. Paine expresses the opinion that the remedy for the evil is "a "clearing house, to which all roads shall report, and which should have "authority to order the movement of cars which are not detained for "good cause." The principal objection to a "clearing house" is the extent of the country; it would take a week to get a report from the Pacific coast, and two to three days to get reports from other extremes of the country; the situation would be so changed before the clearing house got its reports digested that its efforts would generally be anticipated, and the cars ordered forward would have taken up another location before the order to move them would reach the parties in fault.

The great point to gain, is to make it the interest of the companies to handle foreign cars rapidly and to return them promptly, and it will be done. A dollar paid out directly counts for more, with many superintendents, than five dollars paid or lost indirectly, that does not distinctly appear on a voucher.

Viewing, as I do, most freight car blockades as indicating a lack in administrative methods, either from inability to discern what particular facilities are needed, or from lack of capacity to systematize the movement of traffic and correlate its movement with the receipt and delivery, I cannot consent to regard any objection based upon frequent or chronic blockades from other than unforeseen natural causes, as worthy of serious consideration in deciding upon the merits of any plan of settlement for car service.

When, in 1863, the writer was called to the position of Superintendent of the Eastern Division of the Pittsburgh, Fort Wayne and Chicago Railway, he found local freight blockades to be of weekly occurrence, and nearly every Sunday was occupied in "clearing the road" of its weekly accumulation; but he looked for the cause, located and remedied it, and with no particular addition to facilities, but by a systematic use of what they had, the difficulty was wholly removed within a month. But the occurrence of a blockade, when the result of natural causes, can be much mitigated by prompt notice to connecting roads, and an immediate suspension of receipt of freight for the blockaded line.

Mr. O. Chanute, M. Am. Soc. C. E., presents a very able discussion of my paper, to which I respond, partly in answer to his objections to criticisms of my expressed views, and partly in compliance with his formal demand for a concrete plan of enforcing the per diem charge.

Mr. Chanute queries: "Whether the diminished average mileage "obtained from cars is an unmixed evil?"

Probably not. So imperfect are our best plans, and so deficient are our most earnest efforts, that perfection is not to be expected in this any more than in other directions.

But to "Do not evil that good may come" is as applicable to physics as to ethics, and we are not called upon to perpetuate an evil, nor should we defend it, merely because some good grows out of it. Mr. Chanute raises several points of possibly existing advantages, growing out of the decreased movement, but admits that they are only hypotheses, and may not really exist.

I might assume that what Mr. Chanute will not assert, I am not called upon to deny, but I will consider them as fair hypotheses, and try to show that even if they do, in a measure, exist, they do not warrant a continuance of the system.

Taking first the comparison in empty car mileage on the Pittsburgh, Fort Wayne and Chicago Railway:

In 1868, loaded,	82.6.	Empty,	17.4 per cent.
" 1881, "	86.8.	"	13.2 " "
Increase....	4.2.	Decrease	4.2 " "

The increase in loaded mileage from 82.6 to 86.8 per cent. is 5 per cent. of the 1868 mileage, while the decrease in car mileage from 47.67 to 37.72 miles per day is 21 per cent.; and this is in the face of longer runs for the cars in 1881. Certainly an increased loading of 5 per cent. cannot justify a decreased movement of 21 per cent.

"Again," Mr. Chanute says, "the accommodation of customers is (or "should be) the primary object with railroad managers."

I venture the opinion that they do not so understand it.

The "primary object" with railway managers is the production of net earnings. This can best be accomplished by extending reasonable accommodation to customers.

If customers prefer to *pay* for keeping cars idle, then railway companies can afford to keep a surplus of cars for that purpose; but that cannot be properly termed "accommodation of customers" which keeps cars lying empty at one customer's siding or warehouse, while another cannot get cars at all.

I know of a case where a "customer" is "accommodated," but scarcely to the benefit of the railway company.

Having occasion some months since to visit a manufacturing establishment which uses perhaps ten cars of coal per month, and produces ten to twelve cars of product, I noticed a car being loaded with debris, to be unloaded a short distance from the works. The loading of a car took about three days, and when I asked if the railway company allowed its cars to be so used (for the load did not go on its line at all), the manager said, "Oh, I only load this car once, and then I take another;" but the result is he uses one railway company's car (not always the same company) all the time, and pays nothing for its use and does no repairs.

I do not think there has been any such general change in the manner of doing business as Mr. Chanute suggests; certainly no railway company, when business is brisk, sends its cars to a mill, to be detained there "while waiting for shipping orders." The mill proprietors are fortunate if at such times they can get cars to fill the orders on hand.

Goods are not loaded until their destination is known, and manufacturers cannot know whose cars to order until they know to what point they desire to ship.

A reasonable allowance of time for loading, unloading, switching, making up trains, etc., is of course to be made, but there must be a limit.

The average schedule speed of freight trains over each division, or from yard to yard, is probably not less than ten (10) miles per hour, equal to 240 miles per day.

The "average haul" of freight in the Union Line cars in 1881 was 692 miles, nearly, always without transfer. This at 10 miles per hour would occupy 69.2 hours, but at the average miles run by Union Line cars in 1881, of 53.64 per day, or 2.235 miles per hour, it required 309.6 hours average for each car to be loaded, run 692 miles and unloaded.

Now,	309.6	hours	= 12.90	days.
	69.2	"	= 2.47	"
Difference.	240.4	"	= 10.43	"

which shows that each Union Line car stood still on an average 10.43 days between each two average runs of 2.47 days, or, in other words, that it was running but one day out of each 5.32 secular days.

The average haul of freight on the Pittsburgh, Fort Wayne and Chicago Railway in 1881 was 217.63 miles, requiring, at 10 miles per hour, 21.76 hours, or 0.90 days.

The average miles run by cars, 37.72 per day, gives 5.75 days to run 217.63 miles, so that each car averaged a movement of .90 days in each 5.75 days, or one day in each 6.34 secular days. The year 1881 was a season of active movement and great demand for cars. Will any one claim that this amount of "accommodation" is either justifiable or remunerative? (See Appendix.)

The importance of reducing empty car mileage to a minimum, while it was not specifically mentioned in my paper, was not overlooked. I referred to the "more general back loading of cars" as one of the means

by which the increased efficiency noted had been reached, and did not refer to it further because that point is very generally understood and admitted. I agree with all that Mr. Chanute says in regard to its importance, and also to his views of the benefit of a comprehensive warehousing system at terminal points, to operate for other traffic as elevators do for grain.

Considering next Mr. Chanute's criticisms on the proposed "per diem charge" in their order, many of his objections will be seen to have no adequate foundation, as my plan, hereinafter submitted, fully provides for or wholly avoids them.

1. It may, at first, lead to considerable increase in mileage of empty cars, but that is not likely to be its working after it is fully understood, and it does not follow necessarily that because a car is returned empty by the terminal road, that the next road, having a long haul, will haul it over its line empty. Nor will the terminal road return cars empty when there is an active demand for cars on its line. Increased movement may be desirable when cars do not carry loads, if thereby the cars are enabled to carry more loads.

2. Under the plan which I shall hereinafter present in detail, it will not be necessary to "follow the car over the different roads, so as to afford any check to its owner." The owning company gets paid, at the per diem rate, for all the days that each car is absent, and it knows just how long that is.

The check which Mr. Chanute says the owning road now has upon the mileage of its cars, *i. e.*, by its billing, is in practice no check whatever, as the roads do not report the mileage of each car individually, but simply the aggregate mileage made by all cars of each company's ownership for the month.

3. The anticipated increase in expense to which Mr. Chanute refers will not be realized; the clerical labor will not be materially greater than that now required, and a "clearing house" will not be necessary.

4. Opposition is to be expected, particularly "from those roads which profit by the imperfections of the present system," as Mr. Chanute expresses it; such opposition will be futile if the leading railway companies see their account in its adoption.

5. There may be some "temporary confusion" in consequence of the adoption of the change proposed, but it need not be serious nor of long duration.

The questions arising out of the receiving road being temporarily blockaded should be provided for by a general rule; the making of pretences, such as "bad order," upon which to refuse cars, will be, like other flimsy pretences, short-lived and of no importance in the long run.

When a car is destroyed on a foreign road the only equitable way is for the company destroying it to pay its equitable value and the per diem charge for a specific time sufficient for it to be rebuilt by the owning company. A company does not want its cars to be rebuilt by a foreign company.

Companies having a haul so short that they can take cars to destination, unload and return them in less than a day will be an exception, and when such a case exists, with a traffic of any magnitude, the charge for cars can and should be provided for by a special agreement.

6. In the discussion of the rate per diem to be charged under my plan, Mr. Chanute arrives at the conclusion that "A per diem charge of "25 or 30 cents a day would be a fair one all around in the general "exchange of business," and adopts as his basis the average cost of maintenance (covering current repairs, renewals to cover depreciation, and rebuilding of cars to keep the number good), *plus* the interest on the cost of the cars, and figures these items to amount per annum to:

On New York, Lake Erie and Western Railway	$79 42
On Pennsylvania Railway	102 01

Or per day.. $\frac{\$79.42}{365} = 22$ cts., and $\frac{\$102.01}{365} = 28$ cents.

My proposition was to charge only for business days, say 310 per annum, which would make the per diem rate on his basis $\frac{79.42}{310} = 25.6$ cts. $\frac{102.01}{310} = 32.9$ cts.

I must enter my objections to this result as follows:

a.—To the figures for cost of maintenance.

That given for the New York, Lake Erie and Western Railway of $40.92 per annum would require a freight car costing $550 to last equivalent to 13.44 years *without any charge for current repairs*, as it would require 13.44 times $40.92 to pay for its simple renewal.

While I do not question the accuracy of Mr. Chanute's statement that $40.92 was the average expense incurred by the New York, Lake Erie and

Western Railway for repairs of freight cars during the last five years, it must have been based upon a number of cars many of which have been built new within the last five years, and proportionately few of which were five years old at the beginning of that term.

It is well known that during the first two or three years the repairs to a car are nearly *nil*, but that after five years' use they increase very rapidly.

From the data at my command I would estimate the cost of maintenance as at least $75 per car per annum, which, with 7 per cent. interest, $38.50, would make $113.50 per annum, and 36.61 cents per day as the rate that would be chargeable upon Mr. Chanute's basis.

b.—But I cannot concede the basis as at all correct, nor that it is fair and equitable in any sense. It obtains in no other business of which I have any knowledge.

Its adoption by a manufacturer would oblige him to assume all the risks of the business, without charge to his customer.

A railway company adopting it would be obliged to loan its cars in the busy season, when they were all needed on its own line, at a bare "cost of maintenance and interest" basis, and when the dull season came to keep its surplus cars at home at its own cost. If the active season was for six months in the year, it would receive for its average "outage" of cars during that season one-half their "cost of maintenance and interest" and pay the other half itself, for the poor privilege of having its cars ready to loan to its improvident neighbors during the next busy season.

Such a course would be a direct encouragement to the improvident roads to remain so, for why build or buy cars to pay "cost of maintenance and interest" on all the year, when they can borrow them when they are needed, and pay "cost of maintenance and interest" only while they choose to keep them?

The primary object in adopting the per diem plan is two-fold:

First.—To make it the interest of every company to own equipment sufficient for its needs; and

Second.—To make it the interest of every company to handle its cars rapidly and to return foreign cars promptly.

I recognize the propriety of Mr. Chanute's demand for a detailed and specific plan for charging, accounting and collecting the "per diem" charge, and will set it forth in this paper.

It might be inferred from the foregoing that it was the movement of cars only that was sought to be expedited, but my proposed reform applies more forcibly to loaded than to empty cars.

In the letter of Mr. E. P. Vining, Freight Traffic Manager Union Pacific Railway Company, published in April Transactions, attention is called to the unnecessarily slow and altogether uncertain movement of freight, and particularly where he says: "It is curious to observe that "just at the times when the demand for transportation is most active the "movement of freight becomes the slowest." This cannot be accounted for upon Mr. Chanute's hypothesis that the decreased speed is due to cars being delayed for loading or to accommodate the shippers. On the contrary, it is a source of great inconvenience and of material cost to shippers and consignees that freight is so long in transit. On articles worth $100 per ton the interest charge at 6 % is one-tenth of a cent per 100 pounds for each secular day. The loss in interest from time lost in transit amounts to an enormous sum annually.

I would call attention, while upon this subject, to Mr. Vining's letter of January 29th, 1883 (Appendix D), in which he says: "If some officer "were appointed whose duty it was to keep an accurate statement as to "the length of time that such shipment was in transit, and if this state- "ment were properly brought to the attention of the managing officers "of the roads, I believe that many delays that now occur simply through "the inefficiency and carelessness of the lower grades of employees, who "now work, practically, without supervision from any higher officer, "would be remedied." I agree with Mr. Vining that much of the work, under the general head of "Despatching" of cars, is done by subordinates, without any adequate supervision.

I cut from the daily newspaper a few days since the following Associated Press telegram:

"San Francisco, Cal., May 21st.—Freights from New York May 5th *via* New Orleans were ready for delivery here at noon to-day. The Southern Pacific has promised to keep the time up. A freight train consisting of 24 cars, from New York, arrived to-day over the Central Pacific road, the cars having been all the way from 25 to 40 days on the journey."

The all-rail distance from New York to San Francisco is approximately 3 400 miles, and the time named as 25 to 40 days indicates the

speed as from 85 to 136 miles per day, or an average of 3.54 to 5.5 miles per hour.

The distance *via* New Orleans is:

From New York to New Orleans by water.....	2 045	miles.
" New Orleans to San Francisco by rail.....	2 495	"
Total.....	4 540	"

and the time 16 days, allowing only 12 hours for transfer from boat to cars at New Orleans, averages 293 miles per day, or 12.2 miles per hour.

Thus is the old fable of the hare and tortoise practically exemplified.

One of the best, although indirect, results of the per diem system herein advocated would be that thereby a habit of prompt forwarding of cars would be cultivated, and as man is a creature of habit, the benefit would extend to all the cars handled by the companies adopting it.

The systematic making-up of trains with regard to the destinations of the cars; their prompt despatching when made up; having schedules so arranged that trains can ordinarily be kept " on time;" making prompt and regular connections at the division termini; making prompt delivery to connecting railways—these are all requisite to the making of a fair and regular rate of speed, and they are all *practical* and *practicable.* A great cause of delay upon many railways is the making of schedules that trains cannot usually and habitually conform to. It is far better to have a slow schedule, and make it, than to have a fast one and generally fail to make it.

A subordinate official of a prominent line of railway recently said to me in substance as follows:

There is a great lack of co-ordination between the various officials having the transportation interests in charge.

The officer controlling the distribution of cars realizes his inability to supply the demand, and he urges that *more cars* be built.

The division superintendent protests against more cars, saying that he cannot haul the cars he has; his need is *more locomotives.*

The general superintendent, finding trains delayed by other trains, is anxious to secure *more main tracks.*

The general or terminal agent objects to more *locomotives, cars or main tracks* until his yard and station tracks and warehouses are brought up to the capacity of promptly handling the traffic that reaches him; while

the general manager, who should sift and determine what is most needed to harmonize these conflicting views, is apt to be mainly concerned in securing more traffic, or increasing his "share in the pool," and the subordinate officers are left to "fight it out."

It requires careful, systematic and continual study of all the elements of the problem to properly diagnose the disease, and the proper remedy can only follow a correct diagnosis.

The question was asked by Mr. T. C. Clarke, M. Am. Soc. C. E., "What is the basis of compensation for use of foreign cars in Great "Britain ?"

By the courtesy of Mr. James Dredge, Editor of *Engineering*, and of Mr. P. W. Dawson, Secretary of the Railway Clearing House of Great Britain, I am enabled to present, as Appendix C, a full statement of their regulations and rates for car service.

It will be seen that they charge a mileage rate, varying as to distance and as to kind of cars, with an allowance of time for each distance, after which a demurrage charge is made for the excess of time on a per diem basis.

The mileage rates in U. S. currency are as follows (at $4.84 to the £):

Distances.	Box Wagons, Bread Vans and Double Sheep Vans.	Open Wagons, not less than 11 ft. 6 in. long, Cattle Wagons, Timber Wagons.	Open Wagons, less than 11 ft. 6 in. on floor inside.	Sheets.
	Cents.	Cents.	Cents.	Cents.
63 miles or less.	1.344	1.008	0.672	0.336
64 to 85 miles..	1.210	0.908	0.605	0.302
86 " 128 "	1.075	0.807	0.537	0.268
129 " 163 "	0.941	0.706	0.470	0.235
164 " 233 "	0.807	0.605	0.403	0.202
234 and upwards.	0.605	0.453	0.302	0.151

The "sheets" referred to are the canvas covers or "tarpaulins" with which the goods loaded in open "wagons" are covered, and what

strikes an American as most singular, next to the use of open wagons and sheets, is the fact that the charge for a sheet is just one half that for a car of less length than 11 ft. 6 in.

The mileage rates for ordinary cars, as above stated, apply to cars of which the minimum loading is four (4) tons, while for extra sized cars the following rates are charged:

For wagons constructed to carry

15 tons and under 20 tons..... 2.017 cents.
20 " " " 30 " ..... 4.033 "
30 " and above..... 8.067 "

The time allowed, under the mileage charge, is as follows, viz.:

For 119 miles or less, one day, beside the day consumed in loading or unloading.

For 120 miles to 249 miles, two days, &c.

For 250 miles and upwards, three days, &c.

The charges for excess time are per day :

Goods wagons—ordinary open and box..... 72.6 cents.
Cattle " ..... 72.6 "
Sheep vans..... 72.6 "
Wagons carrying 15 tons and under 20..... .....$1.443
" " 20 " " 30..... 2.886
" " 30 " and over..... 4.84

At these rates, an ordinary wagon would pay, for the trip from Buffalo to New York and return, *via* N. Y. C. & H. R. R., say 442 miles each way, if twelve days were consumed in the round trip:

		Of Cars.		Of Sheet.
Mileage.....	884 × 0.453 =	4.004	× .151 c. =	$1 334
Demurrage.....	4 days × 72[6] =	2.904	× 24.2 c. =	968
Total for wagon.....		6.908	Sheet....	2.302
Add for Sheet.....		2.302		
Total.....		$9.310		

And this for a car carrying but 5½ tons.

Double this for 11 tons, we have.....$18.62
While the existing charge in U. S. would be 884 miles at
0.75 cts..... 6.63

Difference..... 11.99

Referring to the system by which these accounts are kept, Mr. Dawson writes as follows:

"The number of miles run by railway companies' wagons on the lines of the other railway companies is ascertained by the Clearing House, which has a staff of number takers at each point of junction where such stock is exchanged from one company to another.

Returns made by this staff, together with returns which the companies render from their own stations, form the basis of the Clearing House accounts.

The number of miles so run by wagons and ascertained by Clearing House for the past twelve months was 256 000 000; while for sheets covering wagons in use 206 000 000 of miles were similarly charged for.

If a wagon be not returned to the owning company line within the time prescribed by regulation, demurrage becomes chargeable at a fixed rate per day. Demurrage so incurred is ascertained by the Clearing House (as in the case of mileage), a separate account of each wagon's running, out and home, being kept.

The number of days so charged for during the past twelve months was 366 000 in respect of wagons, and 135 000 in respect of sheets.

Exceptions to the foregoing general principles are made when necessary, and these are provided for by special regulations, agreed to from time to time.

The Clearing House renders to the companies quarterly accounts of the mileage of stock, and monthly accounts of the days charged for demurrage."

It will be noticed that Mr. Dawson states that the whole mileage run by railway companies' wagons on the lines of other railway companies, in 1882, was 256 000 000, which compares with the miles run by all cars on the Pennsylvania Railroad as follows :

In 1881.....325 180 607
" 1882.....336 871 380

This affords some idea of the scale upon which a Clearing House for all the car mileage of all the railways of this country would have to be organized and conducted, with its "staff of number takers at each point of junction," and its returns rendered by the companies from their own stations. It will also be noticed that the number of days for which demurrage was charged during 1882 was 366 000, and this in respect to cars which ran 256 000 000 miles on foreign roads, so that if the cars had

made the high average of 150 miles per trip, on each line, there would have been some 1 700 000 mileage charges, and an average detention or overtime of only 0.215 of a day each, or only one day's demurrage for each 700 miles run on foreign roads.

This clearly indicates the benefit derived from the demurrage or per diem system.

Through the courtesy of Mr. F. Rinecker, M. Am. Soc. C. E., residing at Wuerzburg, Germany, I am enabled to present (Appendix C) the rates charged for car service on the German railways, the standard car capacity being about 11 tons. The general rate throughout Germany is \$0.238 per day + 00.38 cents per mile run, with a penalty or demurrage for all over the allotted time of \$0.475 per day additional. The allotted time being

2 days for unloading and loading time.
1 day for running..... 46.605 miles or less.
2 days for " 46.606 to.... 139.815 "
1 day for " each ..... 139.815 " additional.

Applying these rates to the case already cited of a car running from Buffalo to New York and return, and occupying 12 days, the charge on the German basis would be:

884 miles, at 0.38 cents per mile.....	\$3.359
12 days, " .238 " " day.....	2.856
9 " allotted time.....	
3 " excess, at \$0.475 per day.....	1.425
Total charge	\$7.640
Charge on American basis.....	6.63
Excess of German basis.....	\$1.01

The average charge per day in the above cited case on the German basis (including mileage) is 63.7 cents, and the actual charge per day for excess time is $23.8 + 47.5 = 71.3$ cents.

On the German and Swiss border roads the rate for excess time is 72 cents per day.

I desire to call special attention to the letters of Mr. E. P. Vining, before referred to (see Schedule D), and particularly to his letter of March 28th,

1883, and the schedule attached thereto, in which, in response to my request, Mr. Vining gives the concrete results of two years' trial of the per diem basis, and shows that its effects were salutary and its operation was in all respects satisfactory.

He shows that during five months in which the per diem system was in effect the Chicago, Burlington and Quincy Railroad cars run on Union Pacific Railroad an average of 93.3 miles per day, while for 12 months following the expiration of that arrangement, when the cars were paid for on the mileage basis, they averaged but 61.1 miles per day, a decrease of 32.2 miles per day, or 34.5 per cent.

Mr. Vining further makes this apparently paradoxical statement:

"During the year ending February 28th, 1879, we paid the Chicago, Burlington and Quincy $6 453.78, and used their cars for 14 093 days, this being an average of a little less than 46 cents per day. We, however, ran these cars only 861 508 miles. If we had run them an average of 93.3 miles per day, as was done during the time that the per diem basis was in effect, we should have retained them only 9 234 instead of 14 093, and for this use we would have paid $4 617 instead of the $6 453.78 which we actually paid. *It therefore appears that both our line and the Chicago, Burlington and Quincy lost money by the change of basis.* They, instead of receiving 50 cents per day, received only 46 cents, and we, instead of the $4 617 for 861 508 miles run, paid $6 453.78 for the service."

Thus we see that the adoption of a fair, equitable and business-like basis works beneficially to both parties and harmful to none.

In a letter from Mr. John Reilly, Superintendent of Transportation of Pennsylvania Railroad, I am advised that "for the first nine months of 1882 the Pennsylvania Railroad cars assigned to the Pennsylvania Railroad and United Railroads of New Jersey divisions, and the mileage these cars made on over other lines and foreign roads, I find that the average daily mileage, including Sundays, was 36.45 miles," equal to 42.52 miles per secular day.

"About 30 per cent. of the equipment was either on foreign roads or the lines west of Pittsburgh during this time. I made an estimate a short time since of the average mileage of some of our cars on the roads in New England, where the movement has been very bad, and found that for one month it was about 20.46 miles per day. (This would pay the Pennsylvania Railroad Company 15.5 cents per car per day.)

This business, of course, is largely through cars, and should have made better time, but it shows to some extent *that foreign roads do not handle the cars of other roads very promptly.*"

Having thus shown—

That the present mileage basis is unjust to the companies furnishing the cars; that it is costly and discouraging to the prompt shippers; that it leads to slow movement of loaded cars and to non-movement of empty cars; and that it is not practiced in other countries, nor does any like practice obtain in any other business in this country, I think I have shown conclusively that a change is not only desirable, but absolutely necessary.

Having also shown—

That the per diem basis is entirely practicable, as witness the two years' trial on the Union Pacific and Chicago, Burlington and Quincy Railroads; that it is in use in a modified form in the two leading European countries (for their system is mainly on a per diem basis); and that where used it has the effect claimed for it, to expedite the movement of cars and freight, I think I have established its claim for adoption, and will proceed to set forth my plan, which is as follows:

1st.—Reports and Settlements.

1. The greatest difficulty, indeed the only one met with in this branch of the subject, is the starting of the system, or changing to it from the mileage basis.

To do this I propose that the change take effect upon the first Monday morning of a month at 6 o'clock; that on the Sunday preceding, each road take an inventory of all the cars on all its lines, including cars put by its engines on private sidings, warehouse tracks, etc., and subsequently make up a report to each company whose cars they have, showing in detail the initials, numbers and capacity in tons of such cars. (See Appendix F, Form 1.) That such company make such report to each company whose cars they have, and indicate thereon through what intermediate lines such cars will be reported to the owning company (Form 2). That a copy of the report (Form 3) be sent to each intermediate company through whose hands it should pass, and when such reports are all in, which they should be by the 15th or 20th of the month, each company should send to its immediately connecting lines a

statement of the cars with which each connecting line is charged, being such as are on its own line, together with such as are on the lines beyond, and reported through it to the owning company.

An example will make this clear. Take the cars of the Pennsylvania Railroad Company, and suppose that the Central Pacific Railroad Company reports (Form 1) that it has (giving initials, numbers and capacity in detail) 6 cars, aggregate capacity 110 tons, and on Form 2 makes the following:

There are on our line (Central Pacific) 6 Pennsylvania Railroad cars, aggregate capacity 110 tons, which we will report through the Union Pacific, Chicago, Burlington and Quincy, and Pennsylvania Company. Then the Central Pacific sends a similar report (Form 3) to the Union Pacific, Chicago, Burlington and Quincy, and Pennsylvania Company.

Then suppose the Union Pacific reports to Pennsylvania Railroad Company (Forms 1 and 2) 24 Penna. Railroad cars, aggregate capacity 385 tons, which we will report through the Chicago, Burlington and Quincy and Pennsylvania Company, sending a similar report (Form 3) to the Chicago, Burlington and Quincy, and Pennsylvania Company.

The Chicago, Burlington and Quincy reports to the Pennsylvania Railroad Company (Forms 1 and 2) 33 Pennsylvania Railroad cars, aggregate capacity 580 tons, which we will report through the Pennsylvania Company.

The Pennsylvania Company reports to the Pennsylvania Railroad Company (Forms 1 and 2) 665 Pennsylvania Railroad cars, aggregate capacity 9 540 tons, which we will report direct.

The Pennsylvania Railroad Company then makes up its account against the Pennsylvania Company thus (Form 4):

"For cars of this company on your lines, and reported through you by your connecting lines, as follows:

Reported by.	No. of Cars.	Capacity.
Pennsylvania Company	665	9 540
Chicago, Burlington and Quincy	33	580
Union Pacific	24	385
Central Pacific	6	110
Total	728	10 615

The Pennsylvania Company, in its statement to the Chicago, Burlington and Quincy, includes the last three charges; the Chicago, Burlington and Quincy includes the last two in its charge to the Union Pacific, which in its turn includes the last item in its charge to the Central Pacific. Thus it makes no difference in the end through what intermediate lines any company reports cars to the owning company, as the intermediate companies pay such charges at one end of their line and charge it to their connecting line at the other end, just as advance charges on freight are paid at one point of connection and collected at another. It will be preferable, however, that foreign cars be reported, so far as can conveniently be done, to the line and by the route over which they will be sent home, or to that by which they are most likely to be returned to their owners.

When all these reports have been exchanged, and all the accounts have been rendered based upon them, each company will have charged to its immediate connecting lines all the cars owned by it, or which are to be reported to it which were off its own lines on the Sunday upon which the inventory was taken as provided, and the number and capacity of the cars appearing chargeable to each connecting line becomes the initial entry of the debit account to which will be added the cars delivered on the first day, and the sum forms the basis of one day's charge or *debit*, to wit: for the Monday next ensuing at the rate agreed upon per car or per ton of capacity, against which will appear the *credit* to which said connecting line is entitled for its cars absent on the first named company's lines and reported to it by its connections, and the cars received on the first day, the balance between the two aggregates being the tonnage to be accounted for during the first day. See example on Form 6.

These debits and credits thus become the starting entries of a statement for the monthly settlement, like the "balance brought forward" on a current account.

The tonnage capacity of the cars is entered, because, as will hereinafter appear, I suggest a rate per diem on the tonnage capacity.

2. Having thus started the account, the keeping of the daily record becomes very simple, and is kept in a form by means of which each company knows that it is getting paid for all the time that its cars are absent, and this regardless of whether or not it keeps any record of the movements of its cars individually.

Each company, at its junctions with other lines, keeps a daily record of the initials, number and capacity of the cars delivered by it to each connecting line, and received by it from each connecting line. This statement is made up daily (Form 5), is signed by both agents at the junction station, in quadruplicate, one copy being kept by each agent and one copy being sent to the car accountant or auditor of each company. The footings of the two sides of this account for the day form the daily entry in the monthly account, in which no distinction is made between the cars owned by the company and those owned by other companies and delivered or received by it.

This will be understood to be true when we consider that in this mode of keeping an account, when company *A* delivers to company *B* a car, capacity 20 tons, *A* becomes entitled to a credit for a 20-ton car, in its account with *B*, irrespective of whether the car be one of *A*, or a car belonging and returned to *B*, or whether it be the car of *C*, *D* or *E* going to or from its domicile over the line *B*.

Neither will it affect the result whether any car be returned to its owner over the route by which it was forwarded, or by another route, and reaching its owner's line at another point.

3. Having reached the end of the month, and the daily accounts or reports on Form 5 having been duly made and forwarded to the proper accounting officer, a monthly "car service account" is then to be stated between each company and its direct connecting lines on a blank (Form 6), the data for which will be in the possession of both companies through the reports on Form 5, received from their respective agents at the junction stations.

The following example of an account stated between the Pennsylvania Railroad Company and the Pennsylvania Company for the first month's car service will fully illustrate this.

[FORM 6.]

THE PENNSYLVANIA RAILROAD CO., IN CAR SERVICE ACCOUNT WITH THE PENNSYLVANIA CO.

For Car Service as per daily reports of cars received and delivered at Pittsburgh during June, 1882.

1883.	BALANCES FORWARD.		CARS.		TOTALS.		BALANCES FOR DAY.		Rate per Day.	AMOUNTS.	
			REC'D	DEL'D							
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.		Dr.	Cr.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Cts.	$ Cts.	$ Cts.
June 4	12 720	10 615	.....	.....	.....	.....	.....	.....	.....	.....	.....
" 4	2 105	.....	2 460	2 945	4 565	2 945	1 620	.....	5	81 00	.....
" 5	1 620	.....	2 850	2 830	4 470	2 830	1 640	.....	"	82 00	.....
" 6	1 640	.....	2 510	3 280	4 150	3 280	870	.....	"	43 50	.....
" 7	870	.....	2 115	2 655	2 985	2 655	330	.....	"	16 50	.....
" 8	330	.....	3 385	3 915	3 715	3 915	.....	200	"	.....	10 00
" 9	.....	200	3 670	3 260	3 670	3 460	210	.....	"	10 50	.....
		Balanc's	.....	.....	.....	.....	.....	.....	.....	.....	223 50
	Total..	.....	.....	.....	.....	.....	.....	.....	.....	233 50	233 50

The first entry is for the amounts of tonnage shown as the totals of reports on Form 4. They will not reappear in this form.

The starting entry for the next month's account will be the "Balance for Day," to Dr. or Cr. on the last day of the previous month.

2D.—RULES AND REGULATIONS.

1. The rate agreed upon should be charged upon the balance for the day, made up as shown in example on Form 6, by bringing forward the balance from the previous day, and adding or deducting, as the case requires, according as the balance was Dr. or Cr., the cars delivered and received during the day.

2. The day may be made to begin, and the previous day to end, at 6 A. M. In this case all cars delivered to either company before 6 A. M. of the next day are to be charged to and accounted for by the company to which they are delivered for the day of delivery. Or, the day may begin at midnight, and all cars delivered before noon be counted as delivered that day, and all delivered after noon be counted as delivered the next day.

In either case, it will be found to work as fairly for one company as the other.

3. When a company has a large traffic, upon which there is a very short haul, it might result unfairly as between it and the next company, as for example:

Suppose road *A* delivers cars to *B*, which *B* transports but 20, 30 or 40 miles, and delivers to *C*; the time required to take the cars from *A*, run them to its junction with and deliver to *C*, may be but four to six hours; it may then appear unjust that *B* should pay for a whole day.

Per contra: *B* may take the cars from *A* and deliver them to *C* in the same day, in which case, while *A* would charge them to *B* for that day, *B* would charge them to *C* for the same day, and *B* would pay no car service whatever.

These cases may be met by the roads interested agreeing to settle for each quarter of a day at one-quarter the daily rate, in which case the monthly account (Form 6) would contain four entries or lines for each day, and a balance would be struck for each quarter of a day.

4. When blockades occur from natural or unavoidable causes, the blockaded road should give prompt notice to all connecting lines, and they to their connections, to stop shipping freight for the blockaded road until the blockade is clear. In this, a case of misfortune, each road should hold the cars it has for the blockaded road, and receive no more until notified that the blockade is clear.

The consequent loss should lie where it falls.

5. When a blockade is imminent from excess of cars and lack of other facilities, the road threatened with blockade should give notice that after days it will decline to receive cars for the threatened point.

All cars that may reach the point of connection within the days should be received by the road giving notice, or accounted for in car service account as if delivered to it, whether actually delivered or not.

The threatened road may give immediate notice to stop loading cars

for its threatened point, in which case it should not be obliged to receive cars loaded after the day of notice until the blockade is clear.

Connecting roads should not be required to receive cars for the line threatened with blockade after the days notice is given, unless it has time to get them to the point of connection before expiration of the days. The threatened or blockaded road should be required to receive or give credit for its own empty cars when tendered at its connecting station. The number of days notice should be enough to allow freight to come from all principal points of shipment, and might vary as to very distant points, so as practically to admit or enable all cars *en route* to reach the point of connection. The management of a company is in fault that permits a blockade from other than natural causes, and should pay the penalty if it does not give ample notice.

6. When a foreign car is destroyed, immediate notice should be given to its owner, and the company destroying it should pay its agreed or assessed value, and the per diem rate for — days, after which time it should be credited through the connecting lines with a car destroyed, as if it had been returned, the notice to credit being issued by the owning company.

The — for number of days should be filled with such number as will reasonably enable the owning company to build or procure a new car.

7. Under this system there will be no "lost cars." If a company destroys a car and does not report it, that company will pay the per diem on it perpetually, as it cannot get a credit except by delivering a car, or in the manner provided for a car destroyed.

8. New cars built off the line owning them, should not be entered in car service account until after their delivery to the owning companies.

9. It has been objected, that when a company has foreign cars, which it cannot load promptly, but for which loading can be had by retaining them for a limited time, that under the "per diem" system, they will be returned empty, when perhaps the owning company does not need them. This case can be provided for by the company having the cars, asking the owning company's permission to retain the cars, free of car service for a definite number of days, until further notice, or until they are sent to be loaded, as may be agreed upon. The settlement for this should be by an account rendered to the owning company, showing the numbers of cars, the dates they were ready to be returned empty,

the dates they were ready to be loaded, or that fixed for their return, and the owning company should repay the per diem charge (which it will have received through the regular channel, that of its connecting road), by a voucher in favor of the company so holding its cars by its consent.

10. Rules can and should be provided, from time to time, to govern exceptional cases, and to relieve any company from any unjust charges to which it may be subject under the general rules.

3d.—As to the Rate to be Charged.

In my former paper I stated, as a principle that should govern settlements for use of foreign cars, that companies using them should pay "the average economic value of the cars in use to their owners." This value I estimated for an average car of 15 tons capacity, with an average load of $\frac{75}{100}$ its capacity, or 11.25 tons, an average mileage of 37½ miles per day, and average net earnings of $\frac{3}{10}$ cent per ton per mile, to be $1.25 per day, and then assumed that $1.00 per day "would be as low a "rate as could reasonably be fixed as a charge for demurrage and for "the use of cars when on foreign roads."

I still consider the reasons given for that view as unanswerable from an equitable point of view, but because many companies will object to the charge, and because most new departures have to be arranged by a compromise of more or less opposing views, I suggest the following as the basis.

1. There being now so many and widely differing tonnage capacities, four-wheel cars of 5 tons and 8 tons, eight-wheel cars of 10 tons, 15, 20, 25, 30, and it is said 35 tons capacity, it is not equitable that the rate should be per car; and consequently the standard or basis should be the tonnage capacity.

I suggest as the rate 5 cents per ton per day, reckoned on the capacity as marked on the cars, and the charge will then be,

For a	5	ton car,	25	cents	per day.
" "	8	" "	40	"	"
" "	10	" "	50	"	"
" "	15	" "	75	"	"
" "	20	" "	1.00	"	"
" "	25	" "	1.25	"	"
" "	30	" "	1.50	"	"

This plan contemplates no charge for Sundays and national holidays, which will be considered and treated as a part of the previous business day.

2. To compensate the terminal lines for the time necessarily lost in loading and unloading, I suggest the allowance of a terminal charge at each terminus of one cent per 100 lbs., or 20 cents per ton, upon each load transported.

This would cover cost of loading or unloading, switching, &c., at say 10 cents per ton, and allow 10 cents per ton, or the equivalent of two days' car service for unloading and the same for loading. This would be the same allowance as is made in England and Germany, and it is a reasonable allowance. Any line taking more time should pay for it. A better system will be required than is now in use for distributing and collecting cars in cities. The engines doing that service should run on schedule time, and when cars are left on a siding or warehouse track they should be receipted for and the time of delivery noted.

3. Shippers and consignees loading and unloading cars themselves should be allowed twenty-four hours after the cars are in position to be loaded or unloaded, and if the cars are not ready when the engine comes for them, not less than twenty-four hours later, demurrage should be charged, say at one-quarter cent per hour per ton on the capacity of the car, from the expiration of the twenty-four hours until the engine gets the car on its next regular trip after the car is ready.

Demurrage charges should be as regularly and certainly collected as freight charges, and the rates should be distinctly set forth in all tariffs and special contracts.

The foregoing furnishes a fair, reasonable, consistent and economical system for charging and collecting a per diem rate for car service. It may require some modifications, but a careful examination will show it to be free from most of the objections urged against such a system.

It is, so far as I am aware, the first attempt to formulate a plan for the per diem charge, the adoption of which in this country in whole as herein outlined, or in part as used in England and Germany, I believe to be inevitable, and that at an early day.

The delivery of freight in the large cities is a matter deserving attention in the consideration of future increased efficiency.

I would call attention to the report furnished by Mr. George A.

Gutch (attached hereto as Appendix E), which gives the manner, cost, and charges made for the "Collection and Delivery of Freight in London and the Provinces by English Railway Companies," which will be found very interesting.

I cannot close this discussion without calling special attention to the necessity of preserving a due and relative strength in the track and bridge superstructure to the load which they are to carry.

The great increase in weight of locomotives and freight cars must be accompanied, *parri passu*, with a corresponding increase in weight of rails and bridges; ties must be laid closer; joints must be further improved, or increased expense in maintenance, and probable increase in train accidents, must follow. The increased weight of loaded cars has already developed a marked increase in the number of broken wheels, and it is evident that wheels should be made heavier and better, and probably of larger diameter. The subject of freight car springs will need attention, which it has not heretofore had.

It has long been my opinion, that a passenger car truck, so far as springs are concerned, would be found economical for freight cars, and particularly when the weight on trucks exceeds 50 000 pounds.

That excellent instrument, the Dynagraph, invented by Mr. P. H. Dudley, now on exhibition at the Chicago Railway Exposition, shows a marked increase in the low joints and other depressions in the steel rail track over which it has been run, since the increase in weight of cars and their loads.

It will amply repay the expense for any railway company to periodically inspect its track by means of Mr. Dudley's Dynagraph Car, the records from which will develop facts of great importance, the existence of which has been unsuspected, or, if known, their lesson has been overlooked.

My especial acknowledgments are due to the officers of the Pennsylvania Railroad Company, the Pennsylvania Company, Mr. E. P. Vining, Freight Traffic Manager, Union Pacific Railway; Mr. James Dredge, editor *Engineering*, of London; Mr. P. W. Dawson, Secretary London Clearing House, and Mr. George A. Gutch, for valuable aid and information furnished for the preparation of this paper.

APPENDIX.

Since the foregoing was read, I have received, through the courtesy of Mr. George Darling, General Manager of the White Line (composed of cars owned by and running on the line of the New York Central & Hudson River Railroad Company, and the Lake Shore & Michigan Southern Railroad Company, and their connections), a statement of the number of cars in the line and the miles run by them in each year from 1868 to 1882, inclusive, which I append, with the average mileage made per day, allowing 313 days per year, as follows :

Years.	No. of Cars.	Miles Run per Car.	Average Mileage per Day.	Averages per Day for Groups of Years.
1868....	506	22 926	73.25	3 years, 78.27
1869....	664	23 000	73.48	
1870....	982	27 567	88.07	
1871 ...	2 018	20 827	66.54	2 years, 71.47
1872....	2 390	23 916	76.41	
1873.. .	3 113	21 227	67.82	6 years, 64.16
1874....	3 126	20 148	64.37	
1875....	3 137	17 389	55.55	
1876....	3 118	20 868	66.67	
1877....	3 125	18 956	60.56	
1878....	3 520	21 908	70.00	
1879....	4 042	20 060	64.09	4 years, 50.83
1880....	4 670	15 332	49.00	
1881....	4 553	14 818	47.34	
1882....	4 780	13 429	42.90	

It will be observed, that as the number of cars were increased, the average number of miles run has steadily decreased; in 1868–70, with less than 1 000 cars the average mileage was 78.27 ; in 1871–2 with over 2 000 cars, it was 71.47 ; in 1873-8 with 3 100 to 3 500 cars it was 64.16 ; and in 1879–82, with 4 000 to 4 800 cars, they averaged 50.83.

Mr. Darling says: "The steady decrease in the mileage of our cars is not so much owing to the increased equipment as it is to the fact that in the early history of the line, White Line cars were used solely for White Line traffic, but later, owing to the necessities of business and other circumstances, many foreign cars were used in the White Line service, and our territory became so extended that our own cars got beyond our control to a certain extent and often were lying idle, while common cars of roads interested were earning the mileage."

In other words, when business is active the companies use the Line cars in their local traffic where they make light mileage, while when business is slack they hold Line cars empty on sidings where they earn no mileage and load their own cars which are thus made to earn mileage properly belonging to the Line cars.

The reduced average mileage during 1879–82 is the more noticeable because they were years of active demand for cars, and during which the increase in car equipment was more than double that of any previous years.

The same state of facts was noticed in the mileage of Union Line cars (Transactions, November, 1882, pp. 382–3) which I will here repeat for the purpose of comparison.

Years.	No. of Cars.	Miles Run per Car.	Average Mileage per Day.	Average per Day for Groups of Years.
1876....	3 983	27 811	88.85	
1877....	3 800	22 668	72.42	
1878....	3 828	24 672	78.82	4 years, 79.91
1879....	4 052	24 904	79.57	
1880....	4 689	19 359	61.85	
1881....	5 843	16 788	53.64	3 years, 53.74
1882....	6 041	14 313	45.73	

While the Union Line average is uniformly better than that of the White Line, the percentage of decrease which *accompanies* the increase in number of cars, is surprisingly similar. Take the averages for 1879

and 1880, when the number of cars used by the two lines were nearly equal and they compare as follows, viz.:

	Union Line.		White Line.	
Years.	No. Cars.	Daily Mileage.	No. Cars.	Daily Mileage.
1879.....	4052	79.57	4042	64.09
1880.....	4689	61.85	4670	49.00
Increase.....	637		628	
Decrease.....		17.72		15.09
Per Cent.....	15.72	22.27	15.53	23.54

While the causes cited by Mr. Darling and the Union Line Officers, doubtless had their effect, the lesson to be drawn from the data presented, is clearly summed up in the following:

1. When cars were few, they received personal supervision of their owners, which kept them in motion so that they made a fair average mileage, although at no time was the mileage what it would have been with other facilities, proportionate to the number of cars, and under the best administrative system.

2. With the enormous increase in the number of cars (five fold in the case of the White Line, from 1870 to 1882), and the almost equally great extension of the territory, over which they are run, personal supervision by the owners became impossible; other facilities, power, terminal, *et al.* were not correspondingly increased, and in consequence, the movement per car per day has fallen off so greatly, as to make it a very serious question whether further increase in cars, under existing circumstances will not be actually injurious.

3. The only posible remedy, for the inability of owners to supervise the movement of their cars, is to make it the interest of their custodians, wherever they may be, to keep the cars in motion. This can be best accomplished by a per diem charge.

This subject merits the most careful consideration of the Railroad

POSTSCRIPT.

To be inserted after page 221, *Vol. XII., June,* 1883, *Transactions of the American Society of Civil Engineers. How can Railways be made more Efficient for the Transportation of Freight? By William P. Shinn, M. Am. Soc. C. E.*

In addition to the annual loss of $15 000 000, estimated as resulting from the existence of 200 000 cars which are not needed for the present or past traffic of the railways of the United States, there are other losses, resulting in part from the existence of these surplus cars and in part from the *inefficient movement* of cars, which is partly the cause and partly the effect of the surplus in their number.

Allowing an average of 35 feet per car for the standing room for these surplus cars (for surplus cars are *always standing somewhere*), it will require 1 325 miles of yard tracks to hold them, most of which tracks will be in or contiguous to cities and large towns. At an average cost of $25 000 per mile, to cover land, grading and superstructure, this will require a capital investment of $33 125 000, upon which the annual interest charge will be, at 7 per cent., $2 318 750.

The maintenance of these tracks, at $1 250 per mile per annum, costs $1 656 250. Mr. Poor, in his Manual for 1883, estimates the value of the freight transported in 1882 on all the railroads in the United States at $15 000 000 000; one day's interest on which, at *six* per cent., would be $2 500 000. If we estimate the average unnecessary detention to this freight at four days we have an annual loss from this cause of $10 000 000, and the annual loss resulting from inefficient car movement in the items above enumerated reaches the enormous aggregate of $28 975 000, with many items of increased expense and consequent loss not included.

The annual interest on the public debt of the United States as it stood at the close of business September 29th, 1883, was $41 767 397.

The loss to the railroad companies, manufacturers and business men of the country arising from the inefficient movement of cars is thus seen to be equal to and probably in excess of *three-fourths of the interest on the national debt.*

Companies of this country. The whole number of freight cars in the United States probably approximates 800 000. If the average miles run per car per day can, by a proper system, and the necessary power, etc., be increased 33⅓ per cent. (as I believe, and think I have demonstrated), it follows that 600 000 cars would do all the work now done with 800 000; the surplus of 200 000 cars represents over one hundred million dollars ($100 000 000) invested where it does no good, and not only that, but where it actually does harm, by impeding the movement of other cars, causing needless blockades, and begetting habits of negligence in the movement of all cars. If this is true, there is a maintenance charge of at least $40 per car per annum, on the surplus 200 000 cars, amounting to eight million dollars ($8 000 000) per year, which with seven per cent. on the unnecessary investment in the cost of the cars, or seven million dollars ($7 000 000), makes an unnecessary charge against the traffic of the country amounting to fifteen million dollars ($15 000 000) per annum.

SCHEDULE A.

SHOWING THE COMPARATIVE COST FOR THE ITEMS OF "RAILS" AND "LABOR REPAIRING TRACK" WHEN THE RAILS WERE OF IRON, WITH THE COST OF SAME ITEMS WHEN THE RAILS WERE STEEL.

PENNSYLVANIA RAILROAD AND BRANCHES.

	Miles Run by Engines.				
Year.	Freight.	Passenger.	Total.	Freight—Per Cent.	Freight—Ton Mileage.
1868.....	6 355 865	2 051 625	8 407 490	75.59	675 775 560
1869.....	6 904 888	2 302 968	9 207 856	74.99	752 711 312
1870.....	7 358 537	2 472 434	9 830 971	74.85	825 979 692
1871.....	8 879 144	2 601 502	11 480 646	77.34	1 011 892 207
1872.....	10 471 582	2 909 374	13 380 956	78.26	1 190 144 636
5 years..	39 970 016	12 337 903	52 307 919	76.42	4 456 503 407
1878.....	11 225 810	3 621 759	14 847 569	75.60	1 732 003 131
1879.....	12 569 348	3 756 820	16 326 168	76.98	2 136 708 887
1880.....	12 505 271	4 270 737	16 776 008	74.54	2 298 317 322
1881.....	14 405 994	4 678 629	19 084 623	75.48	2 655 438 764
1882.....	15 236 589	5 097 229	20 333 818	74.93	2 879 542 701
5 years...	65 943 012	21 425 174	87 368 186	75.47	11 702 010 805

Cost of Maintenance.

Year.	For Rails.	For Labor.	*Assigned to Freight.		Per Engine Mile.		Per Ton Mile.	
			Rails.	Labor.	Rails.	Labor.	Rails.	Lab r.
	Dollars.	Dollars.	Dollars.	Dollars.	Cents.	Cents.	Cents.	Cents.
1868....	962 404	223 260	727 481	168 762	11.44	2.65	.1076	.0249
1869....	768 127	275 901	576 018	206 899	8.34	2.99	0765	.0277
1870 ...	750 370	205 800	561 653	154 042	7.63	2.07	.0679	.0187
1871....	897 790	215 824	694 350	166 918	7.81	1.88	.0686	.0167
1872....	1 021 297	166 989	799 267	130 685	7.63	1.25	.0671	.0109
5 years.	4 399 988	1 087 774	3 358 769	827 306	8.41	2.08	.0754	.0186
1878....	177 799	382 879	131 478	287 657	1.19	2.57	.0075	.0166
1879....	155 003	424 979	104 800	315 589	0.95	2.60	.0049	.0148
1880....	250 181	551 532	179 792	411 343	1.49	3.28	.0078	.0179
1881....	471 016	659 003	326 080	473 039	2.46	3.45	.0123	.0178
1882 ...	492 856	741 119	369 656	561 510	2.42	3.64	.0128	.0195
5 years.	1 546 855	2 759 512	1 111 806	2 049 138	1.79	3.16	.0095	.0175

* The division between Passenger and Freight for 1868-1872 is made on basis of engine mileage—for 1878-1882, it is divided by P. R. R Co.

SCHEDULE A—(*Continued*).

Pittsburgh, Fort Wayne and Chicago Railway.

Year.	Miles Run by Engines.			Freight—Per Cent.	Freight—Ton Mileage.
	Freight.	Passenger.	Total.		
1866.....	3 118 019	1 456 185	4 574 204	68.17	233 274 794
1867.....	3 221 486	1 502 117	4 723 603	68.19	228 791 443
1868.....	3 776 987	1 525 098	5 302 085	71.22	307 443 978
3 years.	10 116 492	4 483 400	14 599 892	69.29	769 510 215
1878.....	5 498 249	1 555 974	7 054 223	77.94	637 470 506
1879.....	6 686 128	1 633 695	8 319 823	80.37	803 083 260
1880.....	6 462 474	1 824 012	8 286 486	77.98	806 257 399
1881.....	7 916 719	2 015 298	9 932 017	79.70	1 044 447 161
1882.....	7 514 672	2 199 716	9 714 388	77.35	991 907 501
5 years.	34 078 242	9 228 695	43 306 937	78.69	4 283 165 827

Cost of Maintenance.

Year.	For Rails.	For Labor.	*Assigned to Freight.		Per Engine Mile.		Per Ton Mile.	
			Rails.	Labor.	Rails.	Labor.	Rails.	Labor.
	Dollars.	Dollars.	Dollars.	Dollars.	Cents.	Cents.	Cents.	Cents.
1866....	435 794	205 305	297 080	139 956	9.52	4.48	.1273	.0599
1867....	480 127	178 954	327 398	122 028	10.16	3.78	.1431	.0533
1868....	438 140	194 410	312 043	138 478	8.26	3.66	.1014	.0454
3 years.	1 354 061	578 669	936 521	400 462	9.27	3.95	.1217	.0520
1878....	119 348	234 736	92 053	182 863	1.68	3.32	.0144	.0286
1879....	118 107	233 882	94 922	187 970	1.44	2.81	.0118	.0234
1880....	77 564	269 148	60 484	210 070	.93	3.24	.0075	.0265
1881....	115 626	293 903	92 153	234 240	1.16	2.96	.0088	.0224
1882....	83 340	305 132	64 463	236 019	.85	3.14	.0065	.0238
5 years.	513 985	1 336 801	404 075	1 051 162	1.18	3.08	.0094	.0245

* The division between Passenger and Freight made on basis of the engine mileage.

APPENDIX B.

Regulations of the Railway Clearing House of Great Britain relating to Compensation for Use of Goods Wagons.*

Mileage Charges.

1. The following is the scale of mileage charges for the use of Wagons and Sheets, with loads of a ton or upwards, whether run in Goods, Passenger, or Special Trains, viz. :

Distances.	Wagons.			Sheets.
	Box Wagons, Break Vans and Double Sheep Vans.	Open Wagons, not less than 11 ft. 6 in. on the floor inside, Cattle Wagons and Timber Wagons.	Open Wagons, less than 11 ft. 6 in. on the floor inside.	
	d.	d.	d.	d.
63 miles & under	.666⅔ per mile.	.500 per mile.	.333⅓ per mile.	.166⅔ per mile.
64 to 85.....	.600 "	.450 "	.300 "	.150 "
86 " 128.....	.533⅓ "	.400 "	.266⅔ "	.133⅓ "
129 " 163.....	.466⅔ "	.350 "	.233⅓ "	.116⅔ "
164 " 233.....	.400 "	.300 "	.200 "	.100 "
234 & upwards...	.300 "	.225 "	.150 "	.075 "

2. The same charges are made for the use of Wagons and Sheets with loads of *less* than a ton of the under-mentioned traffic, viz. :

Fresh Fish. Ripe Fruit (including Apples, Pears and Plums),	if when passing the junction of the parent line the load weighs not less than	5 cwts.
Fresh Vegetables (including Cabbage Plants), Teazles, Wicker, Windsor and Abercorn Chairs, to or from the Manufacturer's Works,	if when passing the junction of the parent line the load weighs not less than	10 cwts.

* Furnished by the courtesy of Mr. P. W. Dawson, Secretary.

3. Double the box wagon rate (as above) is charged for the use of gunpowder vans containing gunpowder or other explosives, whatever the weight of the load.

4. For wagons constructed to carry articles of unusual weight or bulk, and so used, the mileage charges are as follows, viz. :

15 tons and under 20 tons, 1d. per wagon per mile.
20 " " " 30 " 2d. " "
30 " " above 4d. " "

5. Mileage is not charged upon wagons loaded with breeze, cinders, coke, or carrying cannel coal, shale coal, damaged wagons, nor upon empty wagons nor folded sheets.

DEMURRAGE CHARGES.

6. If wagons are detained at stations beyond two clear days, demurrage charges as follows are made, viz. :

Goods wagons (ordinary), open and box, Cattle wagons, Sheep vans, Coke wagons, when consigned to railway companies. Mineral wagons,		3s. per vehicle per day.
Wagons constructed to carry articles of unusual weight or bulk,	15 tons and under 20 tons,	6s. per day.
	20 " " " 30 "	12s. "
	30 " " above,	20s. "

7. Demurrage is not charged upon wagons loaded with—

Blue Billy or purple ore.	Iron ore.
Breeze.	Iron stone.
Cannel.	Lime (not packed).
Char or calcined ironstone.	Limestone.
Cinders.	Mill furnace cinders or burnt ore.
Coal.	Mine, or bull dog, or pig iron dross, or slag.
Coke consigned to private parties.	Shale coal.

8. If sheets are detained at stations beyond two clear days, demurrage is charged as follows, viz. :

For the first day, 6d. per day.
For every day after, 1s. per day.
Maximum charge as for 60 days.

9. In charging demurrage for wagons and sheets, the period of exemption is reckoned; in the case of loaded wagons and sheets in use, up to the time they leave the loading station; but in the case of empty wagons and folded sheets, up to the time they are delivered to the next company at the junction. Should the period of exemption from demurrage fixed by this regulation have elapsed at the time a loaded wagon or sheet in use leaves the station, one day free from demurrage is allowed for getting it to the junction with the next company's line if the distance be under 120 miles, two days if the distance be above 119 miles and under 250 miles, and three days if the distance be 250 miles or upwards. In like manner, empty wagons and folded sheets returning home are allowed an additional day before the demurrage is charged, if the length of the journey be more than 119 miles, and two days extra if more than 249 miles.

One day exclusive of the day on which the wagon or sheet was received is allowed for its transmission over each railway traversed during the journey, if the length of the railway be under 120 miles, two days if the length be above 119 miles and under 250 miles, and three days if the length be 250 miles or upwards, but demurrage is charged if those periods so exempted are exceeded.

10. A company loading or relabeling a wagon, whatever be the weight of its load, in a wrong direction, is charged demurrage from the day on which the wagon is sent wrong until it arrives at home, unless before its arrival it be missent by another company, in which case the liability of the first company ceases, and the second company renders itself liable to demurrage from the time the act of wrong sending is repeated. Companies who detain beyond the usual time wagons sent in a wrong direction by other companies are charged for such excess detention, and the amount is deducted from the charge made against the companies for committing the wrong sending. This regulation applies also to sheets.

APPENDIX C.

EXTRACTS FROM LETTER OF F. RINECKER, M. AM. SOC. C. E., IN REPLY TO LETTER OF INQUIRY INTO REGULATIONS ON THE RAILWAY SYSTEM OF GERMANY, AS TO CHARGES FOR CAR SERVICE.

WUERZBURG, GERMANY, March 9, 1883.

The German railways under the management of the Government, as well as those in the hands of private companies, have for some time past operated under an agreement covering matters of general interest. For

this purpose they form an organization (*verbund*), in which their delegates meet once each year in convention.

One of the questions thus arranged is the payment for service of foreign cars (*wagenmiethe*—lease of cars), for which settlement is made at the following rates, viz.:

1. The general rule is to charge for use of cars on another railway—loaded or empty—1 mark ($23\frac{8}{10}$ cents) per day, *plus* .01 mark (.238 cents), per kilometer run (equal to 38 cents per mile run) per car, the kind and capacity of cars not being considered, the usual tonnage capacity being 10 000 kilos., or say 11 tons. (See rule 4 for demurrage on cars detained beyond allotted time.)

2. Payment for distance run, without a charge per day, is the rule only between Swiss and German border railways; the rate charged is 0.01 franc per Achs kilometer (there being cars with two and three axles), equal to 0.31 cents per axle mile. After the expiration of the allotted time (see rule 4), the charge is 3.75 francs (0.72 cents) per car per day.

3. Payment of a rate per day only is not usual.

4. The time allowed for distances run is:

For 75 kilometers (46.605 miles), or less.....1 day.
" 75 to 225 kilometers (139.815 miles).. .....2 days.
" each 225 kilometers (139.815 miles) farther...1 day.
" unloading and loading.....2 days.

After the expiration of the allotted time 2 marks (47.6 cents) are charged per car per day as penalty (*verzogeringsgebuhr*), in addition to the regular rate of 1 mark per day, making the cost per day over the allotted time 3 marks (71.4 cents,) per car.

From a paper by the well-known M. M. v. Weber, "*Lehrende und rathende zahlen*," published August, 1876, in "*Allgemeine Zeitung*," I gather the following:

"The freight cars of Prussia, in 1874, ran 14 979 axle kilometers.
" " Austria, " " 14 748 "
" " France, in 1867, " 15 107 "

showing that about $20\frac{1}{2}$ days in the year were spent in running and working (earning) movement, while 220 days were spent at stations, loading and unloading, waiting in custom-houses, making up trains, etc., and $124\frac{1}{2}$ days in repairs and on tracks idle.

"Estimating the average load of the freight cars when loaded (the average capacity being 15.600 kilogrammes per axle),

In Prussia, 1874, 7 780 kilos. per axle,
" Austria, " 7 510 " "
" France, " 7 096 " "

we find the cars during the whole year were used only equal to 10 days' actual running capacity, fully loaded.

"Thereby the dead load is 56.400 kilogrammes for 20.000 kilogrammes moved load; and this goes to show the little actual service furnished by the colossal and complicated railway apparatus up to the present time (1876)."

APPENDIX D.

Letters from Mr. E. P. Vining, Freight Traffic Manager Union Pacific Railway Company.

Omaha, January 29th, 1883.

My Dear Mr. Shinn,—I am in receipt of your favor of 20th inst., and am glad to learn that my former letter was of some little use to you. It is one of the points in which our railroad business is open to criticism, that it is a very difficult matter, and one involving a great deal of time and trouble, to obtain any full and reliable statistics as to the time that freight shipped over two or more railroad lines is in transit. No check of any nature is kept by any one, so far as I know, as to the length of time that the freight may be in transit. Movements of cars can be followed, through the car accountant's offices, but when freight is repeatedly transferred *en route* there is no check upon the length of time that may be occupied by the transfers. When freight from New York or any other eastern point reaches Council Bluffs, we have no means of knowing when it started from the point of shipment, except that in some cases, in which there are claims for overcharge, losses or damage, consignee presents us his bill of lading, together with the expense bill. These two papers, taken together, show the length of time that the freight was *en route*, and it was upon my recollection of such claims, as they have been made from time to time during the last eleven or twelve years, that I founded the statements contained in my former letter. I know these statements to be substantially correct as to the usual length

of time, but as I have kept no record upon the subject I cannot give you the official data, and it would require many months' records as to such cases as they arose to secure sufficient data to be of value.

One important step toward the making of better time would be the adoption of some system by which freight could be billed through from point of shipment to point of destination, over as many lines as might be necessary, upon a single way-bill, thus avoiding the present plan of rebilling at transfer points. In order to carry out this plan successfully it would probably be necessary to establish a clearing house. If this plan were adopted, and if some officer were appointed whose duty it was to keep an accurate statement as to the length of time that each shipment was in transit, and if this statement were properly brought to the attention of the managing officers of the roads, I believe that many delays that now occur simply through the inefficiency and carelessness of the lower grades of employees, who now work, practically, without supervision from any higher officer, would be remedied.

Yours truly,

E. P. VINING.

OMAHA, March 2d, 1883.

WILLIAM P. SHINN, ESQ., *Windsor Hotel, New York City:*

Dear Sir,—Replying to your inquiries regarding our trial of the per diem basis for car service, I would state that I took the matter up some eight years ago, with both our western and eastern connections. The General Freight Agent of the Central Pacific Railroad agreed to put the system in practice, but when the attention of the General Manager of the line was called to the subject he canceled the agreement. I could not get any eastern line to consent to the arrangement, except the Chicago, Burlington and Quincy. The General Freight Agent of that line agreed with me that it was the only proper basis, and we finally managed to give it a trial between our two lines.

The basis was strictly per diem, and at the rate of 50 cents per car per day.

This arrangement remained in force between the Chicago, Burlington and Quincy and our line for some two years, when it was abandoned, at the request of the Chicago, Burlington and Quincy, upon the ground that, as we could not get any other lines to join in the agreement, it was

hardly worth while to keep an exceptional arrangement in force between our two lines alone.

The tendency of the arrangement was to ensure prompter movement of the Chicago, Burlington and Quincy cars over our line, and of our cars when upon the Chicago, Burlington and Quincy line, than was and is the case while payment is made on the mileage basis. I cannot see any reasonable objections to the plan of paying per diem for the use of cars, and think it is in every respect superior to the plan of paying according to the mileage. The objections to putting the arrangement in force come from lines which handle their business so negligently as to detain cars for an unreasonable length of time, and upon which it is the practice to use foreign cars for local business, which mileage may or may not be reported to the company owning the cars. The officers of such lines seem to fear that the adoption of a per diem basis will not work as advantageously to them as the basis now in force, and they are, therefore, deaf to all arguments upon the subject.

Taking our case as an illustration, it is frequently the case that we are badly pressed for cars at a time when there is also a great demand upon our eastern connections. In such case, when a car-load of freight reaches Council Bluffs, if it is of such a nature that it seems that it cannot be transferred without injury, it has been customary for us to take the car of our eastern connections and give them one of ours in exchange for it. If in such case we are able to so manage our line as to run the freight car which we receive from Council Bluffs to Ogden and back again, so as to deliver the car at Council Bluffs to the line owning it at the same time that our car is delivered to us after having made a trip from Council Bluffs to Chicago and return, there certainly seems to be no good reason why we should pay them $10.32 for the use of their car, and receive from them only $4.90 for the use of our own.

It would certainly seem as if some plan should be adopted for the interchange of cars which would encourage their prompt handling, and not put a premium upon inefficiency or negligence.

Yours truly,

E. P. VINING.

OMAHA, March 28th, 1883.

My Dear Mr. SHINN,—It has been slow work getting up the statistics which you wished from me regarding the results of our agreement with the C. B. & Q. R. R. Co., which remained in force for some two

years from February 1st, 1876, making the basis for payment by each company for the use of the other's cars, 50 cents per day, instead of ½ cent per mile.

Our men are all kept pretty busy with their regular work, and could only work upon this statement at odd times.

All of our records for a period so long ago are also filed away where it is difficult to get at them, hence it has taken a good deal of time to prepare this statement. Even now, I fear that you will not find it in very satisfactory shape.

The agreement above referred to took effect February 1st, 1876, and was canceled March 1st, 1878. For five months after it was adopted, we kept not only a record of the number of days that C. B. & Q. cars were used, but also kept their mileage record. After the expiration of these five months, and until the termination of the agreement, no records were kept of the mileage of the C. B. & Q. cars in such shape that they can be got at except at a cost of much labor and time. These five months were winter and spring months, when we are always subject to some delays from snow-storms, washouts, etc., and hence the average number of miles run per day is usually less at this season of the year than at other seasons. Allowance should also be made for the fact that these five months were the first after the agreement had been made, when, from the fact that our agents would not all have learned regarding the importance of giving special attention to time of C. B. & Q. cars, and from the fact that any new arrangement seldom works as perfectly when it is first put in force as it does after it has been running a length of time, it could hardly be expected that the mileage made by these C. B. & Q. cars would be as great as during the latter part of the time that the contract was in force. It should always be borne in mind that whatever advantages had resulted from the arrangement in the way of handling cars promptly, would naturally have some effect upon the handling of the cars during the year following the termination of the agreement. The train men and despatchers who had been accustomed to giving special attention to making as good time as possible with C. B. & Q. cars, for a period of some two years, would, from the mere force of habit, and from the fact that some of them may not have known of the termination of the agreement, continue to give somewhat similar special attention to the cars during the year following the termination of the agreement.

Without making allowance for these facts, however, you will observe

that during the five months from February to June, 1876, inclusive, for which we have a record, both of the number of days that the cars were used and the number of miles that the cars were run, we had a use of these cars equal to the use of one car 3384 days, and during that time the mileage of the cars was 315 737 miles, showing an average of $93\frac{3}{10}$ miles per day, During the year following the expiration of the contract, *i. e.* from March 1st, 1878, to February 28th, 1879, inclusive, we had C. B. & Q. cars for 14 093 days, which made a mileage of 861 508 miles, being an average of only $61\frac{1}{10}$ miles per day. In other words, the average number of miles run per day was more than 50 per cent. greater during the time that we paid upon the per diem basis than it was during the time that we paid upon the mileage basis. It is also noticeable that during the time that we paid upon the per diem basis, we kept C. B. & Q cars for an average of $7\frac{2}{10}$ days, while for the year following the termination of the arrangement we kept them for an average of $7\frac{8}{10}$ days.

During the year ending February 28th, 1879, we paid the C. B. & Q. $6 453.78, and used their cars for 14 093 days, this being an average of a little less than 46 cents per day. We, however, ran these cars only 861 508 miles. If we had run them an average of $93\frac{3}{10}$ miles per day, as was done during the time the per diem basis was in effect, we should have retained them only 9 234 days, instead of 14 093, and for their use we would have paid $4 617 instead of the $6 453.78 which we actually paid. It therefore appears that both our line and the C. B. & Q. lost money by the change of basis. They, instead of receiving 50 cents per car per day, received only 46 cents, and we, instead of the $4 617 for 861 508 miles run, paid $6 453.78 for the service.

In the above calculations I have figured the average mileage per day made during the time that the per diem basis was in effect as $93\frac{3}{10}$ miles, although, for the reasons explained in the first part of this letter, I think that the actual average during that time was considerably greater. For instance, in the month of June, 1876, which was a month when we would be but little subject to blockades or washouts, and which was several months after the arrangement had been put in force, so that our men had become somewhat accustomed to it, you will observe that the average car service per day obtained from the C. B. & Q. cars exceeded 100 miles.

Hoping that the statistics contained in accompanying table will not reach you too late to be of service to you, I remain, as ever,

Yours very truly, E. P. VINING.

CAR SERVICE ACCOUNT WITH C. B. & Q. RAILWAY FROM FEBRUARY 1ST, 1876, TO FEBRUARY 28TH, 1879, INCLUSIVE.

MONTHS.	YEAR.	NO. OF CARS HANDLED.	NO. OF DAYS USED.	AV. NO. OF DAYS PER CAR	NO. OF MILES RUN.	PAID TO C. B. & Q. R'Y.	REC'D FROM C. B. & Q. RY.
February.....	1876	52	318	6	30 245	$159 00	$166 00
March.....	"	106	764	7	77 072	382 00	235 50
April.....	"	137	1 470	11	135 455	735 00	267 00
May.....	"	79	511	6	40 364	255 50	222 00
June.....	"	60	321	5	32 601	160 50	191 50
July.....	"	35	293	8	.....	178 50	137 00
August.....	"	33	309	9	.....	154 50	254 50
September...	"	65	491	8	.....	245 50	1 001 00
October.....	"	119	749	6	.....	379 50	911 00
November...	"	107	700	6	.....	350 00	156 00
December....	"	94	734	8	.....	367 00	138 00
January.....	1877	76	607	8	.....	303 50	13 00
Total.....		963	6 967	7		$3 670 50	$3 692 50
February.....	1877	47	256	5	.....	$128 00	$ 42 00
March.....	"	85	722	8	.....	361 00	162 50
April.....	"	116	957	8	.....	478 50	116 00
May.....	"	109	803	7	.....	401 50	105 00
June.....	"	109	907	8	.....	453 50	64 00
July.....	"	85	485	6	.....	242 50	49 50
August.....	"	105	629	6	.....	314 50	217 00
September...	"	316	2 454	8	.....	1 227 00	48 50
October.....	"	402	2 533	6	.....	1 266 50	42 00
November...	"	130	1 208	9	.....	604 00	39 00
December....	"	No Record					
January.....	1878	31	214	7	.....	107 00	105 00
February.....	"	55	229	4	.....	114 50	213 00
Total.....		1 590	11 397	7		$5 698 50	$1 203 50
March.....	1878	118	930	8	59 786	$448 39	$444 44
April.....	"	157	1 118	7	129 400	970 50	346 01
May.....	"	169	1 051	6	90 715	680 36	320 95
June.....	"	110	665	6	57 453	430 89	308 86
July.....	"	119	1 084	9	51 396	385 47	264 40
August.....	"	163	1 248	8	84 200	631 50	279 05
September...	"	217	1 739	8	114 096	855 72	365 61
October.....	"	211	1 644	8	96 280	722 10	1 688 08
November....	"	185	1 634	9	62 818	471 13	326 51
December....	"	171	1 531	9	65 999	494 99	175 69
January.....	1879	86	877	10	23 380	167 85	245 63
February.....	"	96	572	6	25 985	194 88	217 97
Total.....		1 802	14 093	8	861 508	$6 453 78	$4 983 20

APPENDIX E.

The Collection and Delivery of Freight in London and the Provinces by English Railway Companies.

The information herein contained was furnished by Mr. George A. Gutch, at the request of Mr. James Dredge, editor of *Engineering*, in reply to the following letter of inquiry, addressed to Mr. Dredge:

22 Cortlandt Street,
New York, January 30th, 1883.

James Dredge, Esq.,

Edr. Engineering, London, Eng.:

My Dear Mr. Dredge,—I am in search of information in regard to the manner, time and cost of delivery of goods by railway companies in London.

1st. Do the railway companies generally or universally make a delivery at the consignee's store, warehouse or dwelling ?

2d. Within what time after arrival of goods at the railway termini are the goods generally delivered ?

3d. Is the charge for delivery a special or extra charge, and, if so, what is the rate ? Or,

4th. Is it included in the rate for transportation ?

5th. Are the horses and drays, wagons or the plant used in delivery owned by the railway companies, or by other parties who do the delivery by contract with the railway companies ?

6th. Is the same system in effect in other cities of the United Kingdom ?

7th. Are the goods for shipment gathered up by the same agency, or are they hauled to the goods depot by the shippers ?

Yours very truly,
(Signed) WM. P. SHINN.

London, Chatham and Dover Railway.

(The numbers indicate the answers to the questions of like numbers.)

No. 1. The work is generally done by the railway companies; in a few instances special contracts are made by the companies with some carrier ; as an example, Pickford does a great part of the L. & N. W. Co.'s collections and deliveries of goods; but this is a notable exception,

and it may be said fairly that, generally, the English railway companies make the deliveries to domicile.

No. 2. Everything is cleared off within twelve hours after arrival at the termini; in our case the goods trains run into London during the night and early morning, the market goods and perishables are delivered before 7 A. M., and nearly all the generals before midday.

Nos. 3 and 4. The delivery charge is, in the case of the Northern Companies, included in the freight charge; the Southern Companies rates are at present station to station rates, but they are to be revised and the same system adopted as in force on the Northern lines. The Southern Companies' charge for delivery varies from 2s. 6d. per ton to as high a figure as 15s. per ton. If the sender or consignee performs the services of collection or delivery and claims a drawback, the Northern Companies allow the sum of 3s. 4d. per ton out of the rate for each service.

No. 5, All the railway companies possess the plant necessary for collecting and delivering goods.

No. 6. Yes; all over England.

No. 7. Goods are collected from the warehouses, docks, &c., by the railway companies under precisely the same conditions as apply to goods for delivery. On this small system, running through no large centres of industry, and chiefly carrying by goods train, vegetable, fish and market produce, we find the cartage pays us at least 20 per cent., but on the Northern lines I should say the percentage of profit over working is considerably greater.

LONDON, CHATHAM AND DOVER RAILWAY.

STATEMENT SHOWING THE COST OF CARTAGE IN LONDON AND AT COUNTRY STATIONS BY THE COMPANY'S TEAMS, FOR THE HALF-YEAR ENDING DECEMBER 31ST, 1882.

STATION.	AV NO. OF HORSES.	AV. NO. OF VANS.	TOTAL NO. OF TONS.	MOVED PER HORSE PER WORKING DAY.	MOVED PER VAN PER WORKING DAY.	TOTAL EARNINGS.	TOTAL COST.	EARNINGS PER HORSE PER WORKING DAY.	CHARGE MADE TO PUBLIC PER TON.	1882. COST PER TON.
Working Days, 157.				T. CWT.	T. CWT.	£ s. d.	£ s. d.	s. d.	s. d.	s. d.
London	88	52	32,628	2 7	4 0	6,657 12 1	5,410 11 5	9 7.65	4 0.97	3 6.33
Sevenoaks	2	2	634	2 0	2 0	87 15 1	139 9 7	5 7.11	2 9.24	4 4.80
Chatham.....	5	6	2,920	3 14	3 2	452 13 10	354 2 3	11 6.40	3 1.21	2 5.11
Sittingbourne..	2	2	1,010	3 4	3 4	156 7 2	135 2 11	9 11.51	3 11.54	2 8.11
Faversham.....	1	1	729	4 13	4 13	73 11 8	77 3 8	9 4.48	2 0.23	2 1.41
Margate	2	2	626	2 0	2 0	133 18 11	138 6 6	8 6.38	4 3.35	4 5.03
Ramsgate	2	2	1,414	4 10	4 10	157 6 9	149 12 8	10 0.26	2 1.86	2 1.40
Canterbury.. ..	2	2	1,170	3 15	3 15	178 4 3	146 6 2	11 4.21	3 0.56	2 6.01
Dover	6	4	3,042	3 5	4 17	362 8 4	338 1 9	7 8.34	2 4.55	2 6.67
Total.....	110	73	44,173	29 8	32 1	8,259 18 11	6,888 16 11	83 8.34	27 9.51	26 8.87
Average.....	.....	.....	.....	2 11	3 17	.....	.....	9 6.79	3 8.92	3 1.43

COST OF PROVENDER.

	Oats.	Maize.	Beans.	Bran.	Hay.	Clover.	Straw.	Carrots.	Green Food.	Sundries.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Average price.....	19 6	1 16 5	2 8 3	0 12 3	5 2 4	6 5 0	2 2 6				
Cost per horse for the half-year.....	5 16 4	3 3 5	2 8 0	0 6 10	4 2 7	3 6 11	0 6 10	.....	0 3 1	0 3 6	19 17 6
Cost per horse per week (7 days).....	0 04 5.69	0 2 5.27	0 1 10.15	0 0 3.15	0 3 2.12	0 2 6.89	0 0 3.15	.....	1.42	1.62	0 15 3.46
Cost per horse per diem.....	0 0 7.67	0 0 4.18	0 0 3.17	0 0 0.45	0 0 5.45	6 0 4.41	0 0 0.45	.....	0 0 0.20	0 0 0.23	0 2 2.21

GREAT NORTHERN RAILWAY.

1st. The Great Northern Company make delivery to consignees' warehouse or dwelling.

2d. The goods are generally delivered within three or four hours after arrival at the railway termini.

3d. An extra charge is made for delivery beyond the free limit.

4th. The transit charges include delivery service within the free limit.

[NOTE to 3 and 4.—Though in practice we cart, yet owners have the option of carting themselves, and in that case we pay them cartage rebate. But certain classes of heavy goods, called respectively "mineral class" and "station to station traffic," are carried at rates which do not include delivery. In such cases we cart when desired and make a charge.]

5th. The horses and vans used in delivery are owned by the Great Northern Company, but hired teams are employed for extra traffic.

6th. The system varies in other cities, but generally the cartage work is done by agents of the railway company.

7th. Goods for despatch to the provinces are collected by Great Northern vans, and sometimes carted in by senders, but only a small percentage.

[NOTE to 7.—Goods for export shipment in London are delivered by the Great Northern Company either by van, by railway truck or by barge to dock, jetty or alongside ship. Imported goods are collected by the same means.]

MIDLAND RAILWAY.

1st. The railway companies generally deliver to consignees' store, warehouse or dwelling, goods on arrival, except such traffic as is carried at "station to station" rates, in which case an advice of the arrival of the traffic is forwarded to consignee.

2d. Within two or three hours, in the case of competitive traffic; often within one hour, provided consignee lives within the usual limits.

3d. The majority of English companies include the expense

4th. Of cartage at both ends in their rate; stone, grain and mineral products are generally exceptions; these are carried at station to station rates, and the cartage *extra* if performed by the company may be reckoned at 2/ to 2/6 per ton in the country and 4/ to 5/ in London.

5th. The majority of the railway companies own their own wagons and horses in London, and also in many of

6th. Provincial towns, where the cartage is performed for the railroad company by a contractor.

7th. Goods for export shipment are almost all carried by the railroad companies direct to the ship or dock, and are collected in the same manner, the collected and delivered rate of carriage including the delivery to or collection from the ship or dock.

When consignors or consignees perform the cartage operation themselves of traffic that is carried by the railroad companies at "collected and delivered rates," the companies allow them a rebate of about 1/6 per ton in the provinces and 3/6 per ton in London.

NORTH-EASTERN RAILWAY—YORK STATION.

Delivery of Goods.

1st. All but heavy goods are carried between the principal places at rates including collection and delivery, and traffic carried at such rates is, as a rule, delivered at consignee's store, warehouse or dwelling from stations where the company has a cartage staff. Heavy traffic, such as grain, timber, iron, stone, &c., is usually carried at "station to station rates"—that is, rates not including the cost of collection or delivery, the collection being done by senders or at their cost, and delivery by consignees.

2d. Goods are generally delivered on the day of arrival, if there is time to execute the delivery within business hours; if not time, on the following morning.

3d and 4th. The charge for delivery in the case of all but heavy traffic is, as a rule, included in the rate for transportation within a reasonable distance of the station. If beyond that, say two or more miles, a further special charge for extra cartage would be made.

5th. The horses, drays, wagons and other plant used in delivery of traffic carried at rates including that service are, as a rule, owned by the railway companies, but at many of the principal places there are parties who contract with the railway companies to perform the delivery within the ordinary cartage limits and at a given rate per ton, payable by the company.

6th. The above remarks and those in No. 7 apply to the United Kingdom generally.

7th. Goods for shipment—that is, for conveyance by railway—are dealt with in the same way as delivered goods, reversing the action, of course.

NORTH-EASTERN RAILWAY.—NEWCASTLE-ON-TYNE.

1st. At Newcastle it is the practice to tender at the door of consignees' warehouses, dwellings, or stores all general merchandise immediately after arrival of the goods, certainly during the same day, and on such goods our charge for cartage, about 2s. per ton, is calculated in the rate charged for transportation, the horses, drays and other plant used being the property of the railway company. The same system remains generally in all the large towns of the Kingdom.

Goods sent out by rail are collected from the doors of consignees' stores, and otherwise treated in the same fashion as goods received by rail.

Heavy goods, what we call station to station traffic, such as grain, timber, stones, pig iron, &c., are carried at low rates, which do not include collection and delivery, the traffic being put into trucks, or taken out of them and carted away, as the case may be, by the owners themselves in their own carts ; unless they make special contracts for collection and delivery with us, when we charge a rate in accordance with the nature of the traffic and the distance it is carted.

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

1st. In London the railway companies deliver goods at consignee's door unless ordered to the contrary. This does not, of course, apply to rough traffic carried, in mineral or special classes, in full truck loads.

2d. Delivery of market goods is usually completed by 10 o'clock A. M., the first deliveries often taking place between 4 o'clock and 5 o'clock A. M., of goods arriving by train same morning. Delivery of general merchandise distributed over London is generally effected during the forenoon, and in outlying districts by 4 o'clock or 5 o'clock P. M.

3d and 4th. With all the northern railways collection and delivery charges are included in the carriage; the rates of the southern lines being, however, station to station only, an extra charge is made for collection or delivery service, varying from about 2s. to 10s. per ton, according to distance and class of goods.

5th. In London all the railway companies as a rule own the horses and vehicles employed for delivering goods, but there are one or two exceptions where the work is done by contract. Nearly all companies, however, employ agents for surplus work; the teams of such agents being treated as practically part of the company's own plant.

In the country the railways perform their own cartage at all places where the traffic is sufficient to maintain the necessary vehicles. When not sufficient, local carmen are appointed agents.

6th. In all cities and large towns of the United Kingdom the system is practically the same as in London.

7th. The railway companies collect traffic by the same agencies. The system is to act upon standing orders of merchants to call for goods, or to execute orders as received by post. Moreover, a system of receiving offices spread throughout London to which the public take their goods, and at which the railway companies' carts call to collect. Of course, many large firms prefer to employ their own horses for delivery of goods at railway stations, and to claim a rebate from those companies whose rates include the service, collection and delivery. Further, there is the competition of innumerable private carmen who obtain cartage work from the merchants by solicitation.

MIDLAND RAILWAY.—(From another source.)

1st, 3d and 4th. Railway companies universally deliver at consignees' premises in London and other towns. This is done without charge, as the traffic is conveyed at what is called "collected and delivered rates," that is, a rate including collection of goods from the sender's premises, the conveyance by rail and delivery at consignee's premises. This is also called carted traffic. Other traffic is called not carted, or station to station traffic, such as grain, which is brought in by the farmer and taken away by the miller, is charged for at a different rate, which is simply for carriage by rail, and does not include collection or delivery. In case the railway company does the carting at either end, an extra charge is made of from 1s. to 2s. per ton, but this again largely depends upon the quantity to be carted and the distance it is hauled.

The rate for the carted traffic mentioned above only includes delivery within certain limits, which vary for different places.

London is, of course, exceptional. In other towns the limit is 1½ to 2 miles, but this again depends upon circumstances. If a town is served

by more than one railway company competition extends the distance. For instance, a company having a station at one end of a town and a limit of 1½ miles, is compelled to increase this in one direction to 2½ miles, if another company has a station a mile away at the other end of the town.

2d. The greater part of the goods are delivered by noon. Perishable articles first and merchandise and general goods next.

5th. All the larger companies have a staff of horses, men and drays of their own. The Midland Company possess at least 1 700 horses in London alone, but all have contractors for carting as well, the London and North-Western and the Great Western being the largest employers in this way.

6th. Yes.

7th. The rule is that goods are collected from consignors' premises by the railway companies or their agents.

NOTES AS TO CONVEYANCE AND CARTING OF GOODS.—BY MR. GEO. A. GUTCH.

All goods conveyed in this country are comprised under two broad classifications, viz.:

(1.) "Station to Station" traffic, or S. to S.; and

(2.) "Collected and Delivered" traffic, or C. and D.

Under which of these heads any class of goods is rated is settled by the railway companies, who have fixed that certain goods are conveyed by S. to S. rates only, and the rest by C. and D. only, with occasional exceptions fixed by the companies.

1st. S. to S. Traffic.—This is divided into two classes, viz.:

"Mineral" and "Special," each having its own rate, which includes conveyance by rail only.

"Mineral" is carried in quantities of not less than 4 tons.

The "Special" class, consisting of heavy goods or merchandise, such as grain, timber, stone, &c., is carried in quantities of not less than 2 tons. If not 2 tons, the goods are chargeable at first-class C. and D. rates, or as for 2 tons at the special class rate. The rates are fixed and are arranged by the goods manager in relation to the value and quantity of the goods, and the amount of competition.

2d. C. and D. Traffic.—With this traffic there is no restriction as to weight, but a large amount of single lot consignments are under 2 tons.

As the name implies, the rate includes the collection of the goods from the sender, the conveyance by rail, and delivery to the consignee, within certain limits. All goods under this head are divided by the principal railway companies into five classes, each having a fixed rate, which, again, is subject to exceptions under certain circumstances. These exceptions are sometimes very important. For instance, although all goods come under either S. to S. or C. and D. traffic, yet what may be carried C. and D. to one place, say London to Sheffield, might be sent S. to S. to another place, say, London to Manchester ; the latter being an important centre to which all railways run, it has resulted from the competition that exceptions are made in respect of certain goods, and all the companies agree to change to the cheaper rate.

Speaking broadly, the S. to S. rates are always less per ton than the C. and D. rates, as they are intended only for heavy goods ; but, on the other hand, the full amount of 2 tons is always charged. If the S. to S. rate is 20s. per ton, then the carriage of 1 ton by rail would cost 40s. and the cartage in addition ; whereas the C. and D. rate may be 25s. or 30s. a ton ; one ton would only cost that amount.

As to the delivery of goods, the railway companies in London, or their agents, will gladly perform all the carting, that is, they will collect and deliver the S. to S. as well as the C. and D. traffic. The difference in these two classifications is not so much one of carting as of rates for heavy and light goods. If the goods are C. and D. the railway company will collect them from the sender's premises and deliver them as consigned. If consigned to their destination, the railway company will deliver them to the consignee without advising him of their arrival. Should the sender prefer to do his own carting a rebate is allowed, and should the goods be consigned to "await orders" the consignee is advised by the railway company of their arrival, and he will then either send his own team, in which case a rebate is also allowed, or he will order the railway company to forward his goods.

If the goods are under the S. to S. class the railway company will also, if required, collect them from the sender, but they do not attempt to deliver them to the consignee without instructions. He is advised by the company, and he may send his own team or tell the company to do the work.

Practically, it may be said that almost the whole of the C. and D. traffic is carted at both ends by the railway companies or their agents,

but less than 10 per cent. of the S. to S. traffic is so carted, since most large merchants keep their own teams.

Mineral traffic is always led by coal merchants.

As to the limits of the free district and the scale of charges for the collection and delivery of goods in London, the five large companies on the north of the Thames, through whom the great bulk of the goods are conveyed to London, at a Metropolitan Conference held at the Clearing House, agreed upon a boundary which, roughly speaking, includes the whole of London to the north of the Thames and a portion of the south comprised in the bend of the river from about Vauxhall Bridge to the pool opposite St. Catherine's Docks. This district is, roughly, about 8½ miles long by 4 miles broad.

These five companies, viz., the Great Eastern, Great Northern, Great Western, London and Northwestern, and Midland, collect and deliver goods at the C. and D. rates within the above limits free. Outside this boundary the rates increase in the following proportions:

1	mile	beyond	boundary,	1s. 8d.	per	ton.
2	"	"	"	2s. 6d.	"	"
3	"	"	"	4s.	"	"
4	"	"	"	6s.	"	"
5	"	"	"	8s. 4d.	"	"

N. B.—Heavy goods and furniture are charged at double these rates.

The rebate allowed by the railway companies when the C. and D. traffic is not performed by them, is 3s. 4d. per ton at the principal terminal depots in London, and 1s. 8d. at the city depots.

As to the rates for carting S. to S. traffic in London, circumstances have compelled that there shall be three different rates within the above boundary, according to the district. Three of the five companies lie close together to the north, while one, the Great Western Railway is in the west, and another, the Great Eastern, is in the east The neighborhood of the two last is each formed into a small district within the main boundary, and having one side touching the western and eastern boundary respectively. These two sub-districts amount to about one-fifth or one-sixth of the area within the whole boundary.

The standard rates then observed by the five large companies for carting S. to S. traffic are :

In	the	Great Eastern	Railway	district	3s.	per	ton.
"	"	General		"	4s.	"	"
"	"	Great Western	"	"	5s.	"	"

Beyond the boundary the increase in the rates per mile is as given before, and this is added to the 3s., 4s. or 5s. rates, as the case may be, depending upon the quarter.

The bulk of the cartage in London may be said to be at 4s. per ton.

In effect, the general system all over the country is the same. In London, however, the area of the free delivery is larger and the rates for cartage higher than elsewhere. In the country districts the area of collection and delivery may be taken as including the whole town and the suburbs, and should it be served by more than one railway company, they come to an arrangement each to deliver at the same rates over the same distances.

The rate for carting S. to S. traffic in the country varies from 1s. to 2s. per ton, but it depends upon the distance, quantity and nature of the goods; and the rebate allowed in the country for C. and D. traffic not performed by the railway company is 1s. for competitive and 1s. 6d. for non-competitive places.

It is largely the custom with many of the companies to keep their own carting establishments, but at the same time to employ carting agents as well, to assist when wanted, and who contract to do the work at so much per ton.

The London and Northwestern company does comparatively little carting with its own horses and drays, but they contract with Pickford & Co., and so far as the customer is concerned, this comes to the same thing.

At Liverpool, Manchester and other large places, competition results in the bulk of the carting being done by contractors.

But in most other places the rule is for the companies to keep their own stock if the traffic warrants it.

[Form 1.]

APPENDIX F.

Car Service Account—Union Pacific Railroad Company.

Report of Cars on our line on Sunday, June 3d, 1883, belonging or to be accounted for to the Pennsylvania Railroad Company.

Initials.	Numbers.	Tonnage Capacity.	Initials.	Numbers.	Tonnage Capacity.
P. R. R.	6,720	20	P. R. R.	2,340	20
"	4,320	12	"	3,024	15
"	400	10	"	2,304	12
"	5,220	15	"	860	20
"	3,600	20	"	1,520	10
"	2,720	15	"	2,510	20
"	7,620	15	"	942	20
"	2,225	12	"	470	15
"	790	20	"	3,220	15
"	846	12	"	9,620	20
"	1,900	15	"	7,260	20
"	1,320	12	"	3,441	20

TOTAL—24 Cars, 385 Tons.

[Form 2.]

APPENDIX F.

Car Service Account—Union Pacific Railroad Company.

Report of Cars to be accounted for on Sunday, June 3d, 1883, to the Pennsylvania Railroad Company.

This Company had on its lines on Sunday, June 3d, 1883, as per detailed report herewith, cars belonging to the Pennsylvania Railroad Company, 24; tonnage capacity, 385; which will be reported through the following companies:

Chicago, Burlington & Quincy R. R. Co.
Pennsylvania Company.

.....

.....

.....

(Signed).....

Auditor or Accountant.

To the

Pennsylvania Railroad Company.

[FORM 3.]

APPENDIX F.

CAR SERVICE ACCOUNT—UNION PACIFIC RAILROAD COMPANY.

Report of Pennsylvania Railroad Company cars on its lines Sunday, June 3, 1883, as per detailed report. Cars, 24; tonnage capacity, 385; which the Chicago, Burlington and Quincy Railroad Company is hereby authorized to charge this company, and to report the same through the Pennsylvania Company.

.....

.....

.....

(Signed) .....

Auditor or Accountant.

To the

CHICAGO, BURLINGTON AND QUINCY RAILROAD COMPANY.

[FORM 4.]

APPENDIX F.

CAR SERVICE ACCOUNT.

THE PENNSYLVANIA RAILROAD COMPANY charges THE PENNSYLVANIA COMPANY: For Cars of this Company on your lines, and reported through you by your connecting lines as follows:

REPORTED BY	NO. CARS.	TONS CAPACITY.
Pennsylvania Company.....		
Chicago, Burlington and Quincy.....		
Union Pacific.....		
Central Pacific.....		
&c., &c.		
Total.....		

NOTE.—Forms 1 to 4 are to be used only in starting the Car Service Account. The forms No. 5 and 6 will be used in reporting and settling the current accounts.

[FORM 5.]

APPENDIX F.

CAR SERVICE REPORT—PENNSYLVANIA RAILROAD COMPANY.

Report of Cars exchanged, at Pittsburgh Station, with the Pennsylvania Company on day 188

RECEIVED FROM PENNSYLVANIA COMPANY.			DELIVERED TO PENNSYLVANIA COMPANY.		
Initials.	Car Numbers.	Tons Capacity.	Initials.	Car Numbers.	Tons Capacity.

(Signed) ....
Agent Penna. R. R. Co.

(") .....
Agent Penna. Co.

This report is made in quadruplicate; one copy is kept by each agent, and one copy is sent to the accounting officer of each line. Separate blanks may be used, if preferred, for cars delivered by each company to the other. All cars delivered during the day may be entered indiscriminately, regardless of ownership.

For FORM 6, see example given in paper.